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THE UNIVERSITY OF ALBERTA

A LONGITUDINAL STUDY OF ADMINISTRATIVE RATIOS IN URBAN SCHOOL SYSTEMS IN WESTERN CANADA

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Longitudinal Study of Administrative Ratios in Urban School Systems in Western Canada" submitted by Thomas Anthony Blowers in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

The purpose of this study was to establish, for the five school years 1964-65 to 1968-69 inclusive, the relationship between the size of school systems and certain characteristics of their administrative staffs. The main problem was divided into a number of sub-problems and twelve hypotheses were formulated and tested.

The sample consisted of forty-one urban school systems in western Canada which were distributed as follows: eighteen in Alberta, nine in British Columbia, eight in Saskatchewan, and six in Manitoba.

The superintendent of each school system in the sample was asked to supply information on (a) the total number of schools, pupils, and teachers in the system for 1964-65 to 1968-69 inclusive, and (b) the numbers and positions of administrative staff in the school system for the years 1964-65 to 1968-69 inclusive.

For the systems in the sample, the percentage of staff in administrative positions decreased as the size of the school system increased, whether the size of the system was measured in terms of the total number of pupils in the system, the total number of schools in the system, or the total professional and administrative staff in the system.

Smaller school systems had significantly higher mean percentages of staff in total administrative positions, and in central office administrative positions, than did the larger systems. Smaller systems also had significantly higher mean administrative staff per 1,000 pupils, and significantly higher mean administrative staff per 100

teachers, than did the larger school systems in the sample. There were no significant differences between groups of smaller and larger school systems in the sample in either mean total administrative staff per school, or in mean central office administrative staff per school. Smaller systems had significantly lower mean percentages of staff in central office professional positions than did the larger systems. In the school systems in this study the mean pupil-teacher ratio increased from groups of smaller size school systems to groups of medium size school systems, and then decreased in the group of the largest systems.

The relationships between the size of school system and the percentage of staff in total administrative positions, between the size of school system and the percentage of staff in central office administrative positions, between the size of school system and the number of administrators per 1,000 pupils, and, between the size of school system and the number of administrators per 100 teachers, were logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and negative in slope. The relationships between the size of school system and the number of total administrative staff per school, and, between the size of school system and the number of central office administrative staff per school were not of the form $x=e^{a-by}$. The relationships between the size of school system and the percentage of staff in central office professional positions, and, between the size of school system and the pupil-teacher ratio, were of the form $x=e^{a-by}$, and positive in slope.

Threshold sizes were established for fifty-three of the administrative offices in the forty-one school systems in the sample.

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TABLE OF CONTENTS

CHAPTER		PAGE
I.	THE PROBLEM AND DEFINITION OF THE TERMS USED	1
	The Problem	4
	Statement of the problem	4
	Justification of the study	6
	Definition of Terms	8
	Factors considered in the establishment of a definition of administrative staff	8
	Organization of the Study	14
II.	REVIEW OF PERTINENT LITERATURE	18
	Organizational Growth	18
	Summary of the Research on Administrative Ratios	26
	Hypotheses	27
	Summary of Chapter II	30
III.	RESEARCH PROCEDURES	33
	The Sample	33
	Assumptions and Limitations of this Study	34
	Methods Used for Data Collection	35
	Instruments Used for Data Collection	35
	Analysis of Data	36
	Summary of Chapter III	38
IV.	PRESENTATION AND ANALYSIS OF THE DATA	41
	Description of the Seventeen Variables	41

CHAPTER PAGE

Testing of Hypotheses One, Two, and Three. 63

Testing of Hypothesis Four 67

Testing of Hypotheses Five to Eleven 70

Multiple Regression Analysis on Variable (10). 86

Multiple Regression Analysis on Variables (11) to (17) . . 87

Relationship Between Administrative Ratio and Time 100

Summary of Chapter IV. 100

V. THE RELATIONSHIP BETWEEN THE OCCURRENCE OF ADMINISTRATIVE STAFF OFFICES AND THE SIZE OF SCHOOL SYSTEMS 108

Division of the Sample into Two Groups 109

Categorization of Administrative Offices 110

The Smaller Systems. 113

Initial diversification of positions 113

Director of elementary education 113

Supervisors. 117

Consultants. 117

Building and maintenance officer 119

Director of guidance 119

Director of secondary education. 120

Business operations--purchasing agent. 121

Other offices. 122

The Larger Systems 123

The senior administrative level. 124

Departments of elementary and secondary education. . . . 125

CHAPTER PAGE

Subject supervisors and consultants. 129

Pupil personnel services, special education and guidance 131

Director of adult education. 133

Audio-visual supervisor. 135

Library officer. 135

Business management. 135

Building and maintenance department. 136

Personnel department 141

Computer operations department 141

Other offices. 143

Summary of Chapter V 145

VI. SUMMARY OF THE STUDY AND COMPARISON WITH OTHER RESEARCH. . . 155

Summary of the Study 155

Summary of the Results and Comparison with Other Studies . 156

Hypotheses one, two and three. 156

Hypothesis four. 157

Hypotheses five to eleven. 158

Hypothesis twelve. 160

Recommendations for Further Study. 161

BIBLIOGRAPHY 163

APPENDIX 165

LIST OF TABLES

TABLE PAGE

I. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of California School Systems of Different Sizes. 22

II. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of Western Canadian School Systems of Different Sizes 25

III. Yearly Numbers of Teachers, Administrators, Schools, Pupils, Principals, and Percentages of Staff in Administrative Positions for School Systems in the Sample 42

IV. Yearly Numbers and Percentages of Total Administrative Staff, Central Office Administrative Staff, Central Office Professional Staff, and Pupil-Teacher Ratios, for the School Systems in the Sample 51

V. Intercorrelation and Probability Matrix for Seventeen Continuous Variables 64

VI. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes . 69

VII. Probability Matrix For Scheffé Multiple Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes 69

VIII. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes . 71

TABLE PAGE

IX. Probability Matrix for Scheffé Multiple Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes. 71

X. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes. 72

XI. Probability Matrix for Scheffé Multiple Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes. 72

XII. Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes. 73

XIII. Probability Matrix for Scheffé Multiple Comparison of Mean Percentages of Staff in Administrative Positions in Groups of School Systems of Different Sizes 73

XIV. Comparison of Mean Percentages of Staff in Central Office Administrative Positions in Groups of School Systems of Different Sizes 75

XV. Probability Matrix for Scheffé Multiple Comparison of Mean Percentages of Staff in Central Office Administrative Positions in Groups of School Systems of Different Sizes. 75

XVI. Comparison of Mean Administrative Staff Per 1,000 Pupils in Groups of School Systems of Different Sizes. 76

XVII. Probability Matrix for Scheffé Multiple Comparison of Mean Administrative Staff Per 1,000 Pupils in Groups of School Systems of Different Sizes 76

TABLE PAGE

XVIII. Comparison of Mean Administrative Staff Per 100 Teachers in Groups of School Systems of Different Sizes. 78

XIX. Probability Matrix for Scheffé Multiple Comparison of Mean Administrative Staff Per 100 Teachers in Groups of School Systems of Different Sizes 78

XX. Comparison of Mean Administrative Staff Per School in Groups of School Systems of Different Sizes. 80

XXI. Probability Matrix for Scheffé Multiple Comparison of Mean Administrative Staff Per School in Groups of School Systems of Different Sizes. 80

XXII. Comparison of Mean Central Office Administrative Staff Per School in Groups of School Systems of Different Sizes . . . 81

XXIII. Probability Matrix for Scheffé Multiple Comparison of Mean Central Office Administrative Staff Per School in Groups of School Systems of Different Sizes 81

XXIV. Comparison of Mean Percentages of Central Office Professional Staff in Groups of School Systems of Different Sizes. . . . 82

XXV. Probability Matrix for Scheffé Multiple Comparison of Mean Percentages of Central Office Professional Staff in Groups of School Systems of Different Sizes 82

XXVI. Comparison of Mean Pupil-Teacher Ratios in Groups of School Systems of Different Sizes 84

XXVII. Probability Matrix for Scheffé Multiple Comparison of Mean Pupil-Teacher Ratios in Groups of School Systems of Different Sizes 84

TABLE PAGE

XXVIII. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Percentage of Staff in Administrative Positions and Size of School System. 88

XXIX. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Percentage of Staff in Central Office Administrative Positions and the Size of School System. 91

XXX. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Number of Administrative Staff Per 1,000 Pupils and the Size of School System. 92

XXXI. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Number of Administrative Staff Per 100 Teachers and the Size of School System. 94

XXXII. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Number of Administrative Staff Per School and the Size of School System. 95

XXXIII. Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Number of Central Office Administrative Staff Per School and the Size of School System. 96

TABLE		PAGE
XXXIV.	Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Percentage of Staff in Central Office Professional Positions and the Size of School System.	98
XXXV.	Use of Multiple Regression Analysis to Fit a Linear Logarithmic Curve to the Correlations Between the Pupil-Teacher Ratio and the Size of School System. . . .	99
XXXVI.	Categorization of the Administrative Offices Reported by the Twenty-Nine Smaller School Systems in the Sample . .	111
XXXVII.	Occurrence of Administrative Offices in the Twenty-Nine Smaller School Systems in the Sample	114
XXXVIII.	Comparison of the Occurrences of the Offices of Assistant Superintendent and Director of Elementary Education in the Group of Smaller School Systems.	116
XXXIX.	Number of Subject Supervisors and Consultants in Each of the Twenty-Nine Smaller School Systems in the Sample . .	118
XL.	Numbers of Subject Supervisors and Consultants in the Twelve Largest School Systems in the Sample.	130
XLI.	Duties of Supervisors During the 1968-69 School Year in the Four Largest School Systems in the Sample.	132
XLII.	Occurrence of Administrative Offices in Guidance, Special Education, and Pupil Personnel Services in the Twelve Largest School Systems in the Sample.	134
XLIII.	Business Management Offices in the Twelve Largest School Systems in the Sample.	137

TABLE PAGE

XLIV. Buildings and Maintenance Offices in the Twelve Largest School Systems in the Sample. 139

XLV. Occurrence of Personnel and Computer Operations Offices in the Twelve Largest School Systems in the Sample. . . . 142

XLVI. Threshold Sizes for Administrative Offices in Forty-One Urban School Systems in Western Canada for the School Years 1964-65 to 1968-69 Inclusive. 146

LIST OF FIGURES

FIGURE PAGE

1. Comparison of the Means of Variables 10, 11, 12, 13, 14, 15, and 17 in Groups of School Systems of Different Sizes. . . 85
2. Yearly Percentages of Staff in Administrative Positions in Forty-One Urban School Systems During the School Years 1964-65 to 1968-69 Inclusive 89
3. Yearly Percentages of Staff in Administrative Positions in Alberta School Systems 101
4. Yearly Percentages of Staff in Administrative Positions in British Columbia School Systems. 103
5. Yearly Percentages of Staff in Administrative Positions in Manitoba School Systems. 104
6. Yearly Percentages of Staff in Administrative Positions in Saskatchewan School Systems. 105

CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS USED

Warner, Unwalla and Trimm (1967:508-531) note that today we live in an era not only of 'Big Government', 'Big Business', and 'Big Labour', but also of 'Big Education'. In the twentieth century, "education has grown faster than other elements of society in terms of relative proportions of students, teachers, and resources employed." (Warner et al.,1967:508) One of the main trends in education has been sheer growth. With increased urbanization and consolidation of districts, the individual school and the individual school system, have grown bigger and fewer in number, while, at the same time, public school enrolment below college level has progressively increased. Relatively more people are being educated each year and to higher levels. While the number of school districts in the United States with 25,000 or more pupils has increased, the most rapid growth is in systems of 1,200 to 12,000 with the growth of medium and small-sized cities. According to Brown (1968:1-14), similar trends toward the larger school and the larger school district are occurring in all provinces in Canada. Such growth probably affects school organizations in definite ways.

Gill and Friesen (1968:1) indicate that:

> As organizations become larger, the differentiation of functions within them becomes more obvious. . . . Certain tasks, separated out from total performance, become special functions of a specific set of people within the organization.

Blau and Scott (1962:7) state that as groups which are organized for particular purposes increase in size, they tend to accept more complex tasks, act in more complex ways, and become subject to pressures toward more explicit organization. Therefore, as organizations grow, they require an especially elaborate administrative apparatus.

The apparent trend toward increasing size and complexity of urban school systems has implications for educational administrators. (Brown,1968:1-14; Warner et al.,1967:508-531; Campbell et al.,1966:85; Boyan,1963:6-7) Boyan suggests that the growth of specialization, differentiation, and division of labour at the administrative and supervisory level in the larger school systems requires larger and more complex administrative staffs in both the central office and in the individual school. Griffiths et al. (1962:189) point out that the increase in size of school systems has been accompanied by rapid growth of knowledge in each body of subject matter taught in the school, as well as by new areas added to the curriculum. They also state that this has been accompanied by a demand that each child be educated to realize his full potential. These trends all tend to make the educational organization more complex and therefore require more specialists.

At present there is still some doubt about the nature of the changes which take place in the structure of organizations as they grow. Boulding (1963:326-340) states that structural growth by its very nature involves increasing complexity. He derives this conclusion from his principle of non-proportional change: since the rates of

growth of the various parts of an organization are not proportional, growth always entails internal adjustment and change. He mentions that "the development of an administrative apparatus is one of the most important changes that occurs as organizations become larger and more complex." (Boulding, 1963:327)

Tosi and Patt (1967:161) state that there have been conflicting thoughts and suggestions on the relationship of the administrative component to the size of the containing organization. Parkinson (1957:24-25) suggests that the less work there is in an organization the greater are the increases in its administrative staff. He quotes statistics on the British Colonial Office to show that the number of administrators increased while the number of colonial dependencies decreased. Terrien and Mills (1955:13) conclude from their research on California school systems that the administrative proportion increases as the size of the school organization increases. Caplow (1957:502) agrees in saying that:

> Large groups apparently devote a larger proportion of their resources to their own operation than do small groups. . . . It would appear that small groups require proportionately less self-maintenance. There is an almost universal belief that the administrative and overhead components of any organization increase out of proportion to increases in its size.

As is indicated in the review of literature in Chapter II, others suggest that the relative size of the administrative component decreases as the size of the organization increases. For example, Litterer (1965:403) states that a change in form from simple to complex organization should be accompanied by improvement in overall performance. Economies of scale can be realized through larger size.

Gill and Friesen (1968:4) mention that the higher degree of specialization in larger systems may tend to increase the span of control of each administrator.

These considerations led to questions about the ways in which the characteristics of administrative staffs vary with the size of the school system.

I. THE PROBLEM

Statement of the Problem

An attempt was made to expand Gill's (1967) cross-sectional research on administrative proportion on a longitudinal basis. The study sought to establish relationships between the size of school systems and the size and certain characteristics of their administrative staffs, for the five school years 1964-65 to 1968-69 inclusive for forty-one urban school systems in western Canada. In order to make this study directly comparable with Gill's (1967) research, similar definitions of terms, similar samples, and similar hypotheses and methodology were used in both studies. The results of this study were also compared with those of Anderson and Warkov (1961), Hawley (1965), Terrien and Mills (1955), Indik (1964), and Gittell (1968).

The purpose of the study was to establish, for the five school years 1964-65 to 1968-69 inclusive, the relationship between the size of school systems and certain characteristics of their administrative staffs.

Subproblems. The problem was divided into a number of sub-

problems as follows:

1. What is the relationship between the percentage of staff in administrative positions in a school system and the size of the school system in terms of the total professional and administrative staff?
2. What is the relationship between the percentage of staff in administrative positions in a school system and the number of schools in the system?
3. What is the relationship between the percentage of staff in administrative positions in a school system and the number of pupils in the system?
4. Are there any significant differences in mean percentages of staff in administrative positions in groups of school systems of different sizes?
5. Are there any significant differences in mean percentages of central office administrative staff in groups of school systems of different sizes?
6. Are there any significant differences in mean administrative staff per 1,000 pupils in groups of school systems of different sizes?
7. Are there any significant differences in mean administrative staff per 100 teachers in groups of school systems of different sizes?
8. Are there any significant differences in mean total administrative staff per school in groups of school systems of different sizes?

9. Are there any significant differences in mean central office administrative staff per school in groups of school systems of different sizes?
10. Are there any significant differences in mean percentages of central office professional staff in groups of school systems of different sizes?
11. Are there any significant differences in mean pupil-teacher ratio in groups of school systems of different sizes?
12. Does each administrative office begin to occur consistently at a specific size of school system?

Justification of the Study

This study has implications for the organization and administration of school systems. School boards and superintendents may find the collected data useful to forecast the numbers and specialties of administrators required in the various categories as school systems grow. That this type of data is required was indicated by a survey conducted in 1968 by the Saskatoon Public School Board to obtain information, for comparison purposes, on the size of schools, and numbers and specialties of administrators, and pupils and teachers, in ten urban centres in western Canada. Information on changes in numbers and specialties of administrators as school systems grow may also be useful to institutions engaged in the training of educational administrators in that they may give an indication of the changing requirements in terms of numbers and positions required for administrators.

The data may be useful to forecast what happens to the size and cost of the administrative component in school systems over time. Tosi and Patt (1967:162) mention that the size relationship between the administrative component and the 'production' component of a system is important in terms of cost, use of resources, and efficiency. He states that, "it remains for the administrative unit to justify its cost of operation by the addition of benefits, services, relief and assistance it provides operating units."

From the point of view of knowledge about the structure and growth of organizations, this study may provide additional information on some aspects of organizational growth. Starbuck (1965:519) states that data is needed on almost every aspect of organizational growth and development. Hall, Haas, and Johnson (1967:912), and Starbuck (1965:519) both state that longitudinal studies are clearly needed. Hall et al. (1967:904) indicate that findings from studies on the relative size of the administrative component are indicative of the problems associated with the utilization of size as a major analytic variable in the study of organizations.

As is indicated in the review of the literature in Chapter II, a large number of studies of the growth of organizations have been conducted. Most of these studies have been concerned with business and industry and public institutions other than school systems. Of the three reported studies on school systems, only one is Canadian, (Gill,1967), and only one is longitudinal (Gittell,1968). In addition, some disagreement exists among the findings of the three school studies, and also between the findings of these studies and

studies in other fields. A major purpose of this study was to determine whether a longitudinal analysis would confirm Gill's cross-sectional results, and then to compare the results of the present research with the other studies of school systems.

Blau and Scott (1962:15) state that one method of classifying social research emphasizes the purpose for which the data are collected. Under this classificatory scheme the design of this study was descriptive. The essentials of such a study are summarized by Blau and Scott (1962:15):

> . . . descriptive studies . . . define and portray the characteristics of the object of research or determine the frequency of various occurrences and examine their associations with one another. . . .

II. DEFINITION OF TERMS

Factors Considered in the Establishment of a Definition of Administrative Staff

Sears (1950:31) describes five different kinds of activities as characteristic of the administrative process, namely, planning, organizing, directing, coordinating, and controlling. Shaw (1965:26), among others, supports Sears:

> Administration is the increasingly specialized activity which plans, organizes, and directs the resources of people and things to the support and enablement of the teaching-learning situations appropriate to the institution's goals and to the needs and purposes of students, faculty, and society.

Administrative staff, then, might be declared to be those who plan, organize, direct, coordinate, and control.

In his study, Indik (1964:302) defined supervisors as, "those

individuals whose functional role involved mainly direct interpersonal supervision or key organizational decision-making." Persons in the organization who were serving mainly clerical functions, or who were directly concerned with production, were excluded from the category of supervisor or administrator. Therefore, Indik's definition of supervisors would be subsumed under Sears' category of administrative staff.

In their definition of the administrative component of a school system, Terrien and Mills (1955:12) included the superintendent, his assistants and immediate staff, principals and business managers. Persons not included in the administrative component were "teachers, nurses, custodians, cafeteria workers and the like," which suggests agreement with Indik's definition.

Harris' supervision model (1963:7-11) helps to distinguish administrative from non-administrative staff. In this model, Harris examined the major functions of school operation with respect to directness of their relationship to pupils and instruction. He demonstrated that the teaching function was directly related to both pupils and instruction, whereas the functions of supervision, management, and general administration were not directly related to pupils. This lack of a direct relationship of administrative personnel to pupils is a characteristic which can be added to Indik's definition to justify the exclusion of school personnel which Terrien and Mills (1955) did not include in their definition of the administrative component.

These distinctions will exclude personnel on central office or

administrative staffing lists whose work consists mainly of direct relationships with pupils. Guidance officers, visiting teachers, reading clinicians, and speech therapists are persons concerned with an extension of the instructional program with special emphasis on pupils as individuals. In this study the personnel mentioned above in this paragraph were categorized as central office professional staff to distinguish them from the central office administrative staff. Griffiths et al. (1962:207) state that the special services rendered by these people are provided with the goal in mind that "each child should be in the best condition possible to make use of his potentialities for growth through the educational program." The coordinators of such pupil services, however, would be included in administrative staff since they have direct supervisory relationships with people working with pupils towards the achievement of the system's educational program.

Campbell et al. (1966:96,133) point out that administrative staff concerned with business management, building, and other systems maintenance of the operation of school systems should be included among the administrative component of school systems. In their categorization of administrative tasks they include the following areas: school-community relationships, curriculum development, staff personnel, pupil personnel, physical facilities, finance and business management, and organization and structure.

Campbell et al. (1966:120-124) state clearly that administrators have responsibilities for the operation and maintenance of school plant, for planning new buildings and the modification of old ones,

the objectives being to secure effectiveness and efficiency in the use of plant for both proper support of the instructional program and the use of funds.

Administrative responsibilities in the area of business management, according to Campbell et al. (1966:122) include the management of expenditures and the direction, supervision and appraisal of performance of non-teaching personnel. Therefore, officers who have administrative responsibility for physical facilities, finance and business management were included by them within the administrative component of a school system.

Administrative Staff (Administrative Component of a School System)

On the basis of the literature reviewed above, administrative staff was defined as being staff who (a) may be distinguished by the fact that their main tasks do not lie in direct relationship with pupils; (b) undertake a variety of tasks; and (c) undertake one of the following tasks:

i) The planning, organizing, directing, coordinating, and/or controlling the activities and personnel of the school system.

ii) The making of key organizational decisions.

iii) The supervision of the work of other personnel.

There are two subgroups which meet these criteria. Therefore, for the purposes of this study, the total administrative staff of a school system was defined as the total of the following two categories:

(a) administrative personnel employed in the central office of school systems;

(b) principals of schools.

No note was taken of the administrative functions performed by personnel on school staffs other than principals. For several reasons offices such as vice-principal, department head, and chief custodian were omitted from consideration. Previous research on administrative ratios gave no indication of having taken these offices into account, so for the sake of comparison with other studies already completed they were not listed in the present research. As the roles of such people are not uniformly defined in any detail in the literature, there is insufficient theoretical justification for including them in the administrative staff. Gill (1967:10) reported that few school systems, when asked to name their administrative staffs for his study, made mention of any office below that of principal.

Administrative Ratio (Administrative Proportion)

Administrative ratio was defined as the ratio

$$\frac{\text{total number of administrative staff}}{\text{size of school system}}$$

In some of the calculations in the data analysis the administrative ratio was expressed as a percentage.

Size of School System

Three separate measures of the size of school system were taken. These were:

i) The total number of schools in the system;

ii) The total number of pupils in the school system;

iii) The total number of professional and administrative personnel employed in schools throughout the system and at central office.

This was obtained by totalling the following three categories:

(a) all certificated personnel, including principals, employed as members of school staffs;

(b) all personnel identified as administrative staff, and employed directly in or out of the central office of the school system;

(c) all personnel who were employed in or out of central office in professional tasks, but who were not categorized as administrative staff.

Personnel listed on staffing returns who could not be categorized as teachers, professional employees, or administrative staff were excluded. That is, non-professional clerical, custodial, cafeterial, transport, stores, equipment and maintenance staffs were excluded.

Central Office Administrative Staff

The central office administrative staff consisted of all personnel identified as administrative staff, and employed directly in or out of the central office of the school system.

Central Office Professional Staff

The central office professional staff consisted of all university-trained or equivalent personnel who were employed in or out of central office in professional tasks, but who could not be categorized as administrative staff. Included were such personnel as psychologists and social workers. Their primary task was to work with children. They did not exercise significant interpersonal supervision of any staff in the system.

The methods of defining the size of school system used in this research were similar to those used by Terrien and Mills (1955), Gill (1967), and Gittell (1968). The reason for the use of the definitions chosen was to facilitate comparison with other studies.

Consistent Occurrence of an Administrative Office

When school systems were ranked in order of size from smallest to largest, an office was arbitrarily said to occur consistently, if, above a certain size of system, it appeared in at least fifty per cent of cases.

Threshold Size

When school systems were ranked in order of size from smallest to largest, threshold size was defined as the size of school system at which a particular administrative office began to occur consistently.

III. ORGANIZATION OF THE STUDY

Chapter I contains a statement of the problem and the sub-problems derived from it.

In Chapter II pertinent literature related to the present study is reviewed and twelve hypotheses are proposed.

The sample, research procedures, methods and instruments used for data collection, and the statistical procedures used in this study are described in Chapter III. The assumptions and limitations of this study are also included in Chapter III.

The data analysis is presented in Chapters IV and V. Eleven

hypotheses are tested in Chapter IV. All of Chapter V is devoted to testing hypothesis twelve which states that each administrative office begins to occur consistently at a specific size of school system.

Chapter VI contains the conclusions of this study, implications for practice, and recommendations for further study.

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CHAPTER II

REVIEW OF PERTINENT LITERATURE

Organizational Growth

Organizational growth and development is a subject of continuing concern in organizational theory. Various models of organizational growth have been proposed. Starbuck (1965:482) arranges the various models along a continuum and divides them into four groups:

> (a) Cell-division models and (b) metamorphosis models focus on patterns in the size and structure of the organization as it expands. (c) Will o' the wisp and (d) decision-process models focus on the mechanisms internal to the organization by which growth is effected.

Litterer (1965:397) states that organizational growth is one of the least developed areas in the study of organizations. He considers two aspects of growth--the changes characterized by growth and aging, and the changes in which an organization adapts to shifts in its external environment. He considers the 'biological' aspects of organization, the changes that accompany growth and aging, to be of immediate concern.

Mouzelis (1967:179) points out the need for longitudinal studies of organizational growth when he states that, "the organizations studied seem to exist in a timeless dimension." The present research is a longitudinal study on organizational growth which attempted to examine the relationship between the size of school systems and certain characteristics of their administrative staffs.

Many authors (Boulding,1953:329; Haire,1959:273; Litterer,1965,

430) believe that as organizations become larger, relationships between their parts begin to differ and new structures are required to support the changed form of organization.

Theorists have developed various aspects of what has been called the complexity assumption, and have pointed to the probable need for proportionately heavier structure, that is, increased administrative staffs, as organizations grow. (Starbuck,1965:496) Tosi (1967:161) points out that there have been conflicting thoughts and suggestions on the relationship between the size of the administrative component to the size of the containing organization:

> Some have held that the ratio of administrative to total personnel increases in a 'Parkinsonian' fashion as organizational size increases. . . . Others posit the opposite: that the relative size of the administrative component decreases as organizational size increases.

Blau and Scott (1962:226) point out that it is widely assumed that large organizations tend to be over-bureaucratized, that is, an increase in organizational size is accompanied by a disproportionate increase in administrative staff. They indicate that the evidence does not support this assumption, and they review the findings of several studies of industry to support their belief. Starbuck (1965:509) has indicated that the paucity of research in this area increases the hazards of drawing conclusions regarding organizational size and its relationship to the administrative component.

In a longitudinal study of American manufacturing industries Melman (1951:62-112) found the relationship between organizational size and the component of administrative officials to be an inverse one. He studied the administrative component in relation to organizational size,

industry size, corporate organization, concentration of control, and operating characteristics, and concluded that differences in the administrative component were independent of all variables except size.

In a study of manufacturing industries in Ohio, Baker and Davis (1954:14-15) found no relation between size of organization and proportion of administrators. A study by Bendix (p.221) of German industry in the 1930's showed an inverse relation between the size of organization and ratio of administrators. Blau and Scott (1962:226) suggest that administrative ratio increases during early growth, and that further growth is not accompanied by increases in administrative overhead.

Haire (1959:296-297), in a study of four manufacturing firms, concluded that, "management grows in size as the total grows, but more slowly than the total, and it is an increasingly smaller part of the whole." He also states that the span of control of supervisors increased with organizational growth as each supervisor was responsible for more men. In his longitudinal study Haire (1959:292) divided administrative staff into line and staff functions, and he concluded that during the early stages of growth more staff than line specialists were added, while during later stages of growth staff and line personnel increase at a similar rate.

These studies raise questions about the type of relationship that exists between the ratio of administrative staff and the total size of organization in school systems. For example, are the changes in administrative ratio revealed by industrial studies similar to or different from those occurring in school systems? Studies such as

the one by Haire (1959) raise questions about the size of the school system at which various administrative offices are added to the organization.

The cross-sectional study by Terrien and Mills (1955:11-13) on California school districts was an attempt to determine the relationship between the administrative component of school districts and the total size of the districts. The three types of school district studied--elementary districts, high school districts, and unified-city districts--were subdivided into categories of small, medium and large. The results, which are partially reproduced in Table I, indicated that for all three types of school district studied the size of the administrative component increased as the size of the district increased.

The results of a study by Anderson and Warkov (1961:26-27) differ from those of Terrien and Mills (1955). Anderson and Warkov studied forty-nine hospitals and related administrative ratios to both organizational size and complexity. They concluded (1961:26), "the larger the hospital the smaller the per cent of personnel in administration." In an attempt to reconcile the findings of the two studies, Anderson and Warkov (1961:27) suggest that as size increases, the relative size of the administrative component decreases, but that, "the relative size of the administrative component increases as the number of places at which work is performed increases," or as roles become increasingly specialized and differentiated.

Tosi and Patt (1967:164-168) studied administrative ratios in thirty-six United States Army hospitals and concluded that administra-

TABLE I

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF CALIFORNIA SCHOOL SYSTEMS OF DIFFERENT SIZES[a]

Group designation	Number in group	Size range	Administrative component-mean percentage	Standard deviation
small	31	13-249	13.7	3.7
medium	27	250-999	14.3	2.5
large	10	1000-4624	15.6	1.7

[a]This table contains the data for unified-city school districts from the cross-sectional study by Terrien and Mills (1955:13).

tive ratio decreases with increases in organizational size. They included in their administrative component "only those engaged in full-time administrative duties." They suggest that the economies and diseconomies of scale may apply in administrative support units. That is, as organizational size increases, the administrative component decreases, up to a point where the administrative staff can no longer service the entire organization, and then it begins to increase again. Tosi and Patt (1967:168) also suggest that as the organization grows in size and more specialties are required, that a greater number of administrative and support units may be needed.

Indik (1964:301-309) examined the relationship between supervisory ratios and organizational size in five different types of organization and concluded that the relationship between organizational size and supervision ratio is logarithmic in form, curvilinear in shape, and negative in slope. That is, as organizational size increased beyond a threshold level, the supervision ratio logarithmically decreased. In an attempt to reconcile his findings with those of Terrien and Mills (1955), Indik suggests that the discrepancy between the results may be due to the fact that Terrien and Mills included non-supervisory personnel in their administrative component.

Gittell's longitudinal study (1968:53-55) of the school systems of New York, Chicago, Detroit, St. Louis, Baltimore, and Philadelphia presents conflicting results. Administrative staff was defined to include all professional supervisors from bureau chief to superintendent. Two administrative ratios were developed. First, administrative staff were identified and comparisons were made on the

basis of the number of administrators per 1,000 pupils. On this basis the administrative ratio for New York doubled between 1955 and 1965 while for all other cities except Detroit it remained approximately the same. In Detroit the ratio rose by slightly less than one-third. The administrative component was also analyzed in terms of the number of administrators per 100 classroom teachers. The ratios in 1965 were almost identical with 1955 except for New York City where the ratio doubled between 1955 and 1965. There was also a great deal of difference in the size of the administrative ratios among cities.

Hawley (1965:253-254) studied the relationship between the size of the administrative component and the size of the organization in 116 institutions of higher education in the United States. The measure of size of the institution was the total number of faculty. The administrative component included only full-time administrators. He concluded that the ratio of administrators to organizational size declines as the size of the faculty grows. Contrary to the suggestion of Anderson and Warkov (1961:27), Hawley found that the administrative ratio decreased as the number of places at which work is carried on increased.

In a cross-sectional study of thirty-eight school systems in the four western provinces of Canada, Gill (1967) attempted to determine the relationship between the size of the school system and its proportion of administrative staff, and, the size of school system at which each administrative office began to occur consistently. The results indicated that the relative size of the administrative component decreased as the size of the school system increased. When school

TABLE II

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF WESTERN CANADIAN SCHOOL SYSTEMS OF DIFFERENT SIZES[a]

Group designation	Number in group	Size range	Administrative component-mean percentage	Standard deviation
Small	18	47-248	10.7	2.3
Medium	12	252-761	8.6	1.2
Large	7	1026-3099	6.7	1.3

[a]Taken from Gill's thesis (1967:46).

systems were arranged in order of size and when administrative positions were identified, the size of school system at which some of the administrative offices began to occur consistently could be established. Throughout the data analysis in this thesis, the results of Gill's study are compared with the findings of this research in both the areas of administrative proportion and the threshold size for the occurrence of administrative offices.

Summary of the Research on Administrative Ratios

The findings of the above studies lead to the general conclusion that the ratio of administrative staff in an organization decreases as organizational size increases. However, two of the studies on school systems, those of Terrien and Mills (1955), and Gittell (1968) have produced results which disagree with this generalization.

There are conflicting suggestions by Anderson and Warkov (1961) and Hawley (1965) on the relationship between the ratio of administrative staff in an organization and the number of places at which work is carried on in an organization.

Most of the reported studies of administrative ratios in school systems are cross-sectional. Haire (1959:292) points out that cross-sectional studies of organizational growth may give spurious growth curves. He states that cross-sectional studies do not give a growth curve representing the dynamics within an organization, but rather, are a set of static measurements arranged by size. Tosi and Patt (1967:165) point out that, "the ideal method for examining changes in administrative ratios over time would be to examine changes in several

organizations over time."

Gill's (1967) cross-sectional study is the only one mentioned in the literature which has attempted to predict the threshold size for the occurrence of administrative offices as school systems grow.

The present longitudinal study is directed toward clarifying these relationships as they exist in the urban school systems of western Canada.

Hypotheses

Hypothesis one: The ratio of administrative staff in a school system decreases as the total number of professional and administrative staff increases.

Hypothesis two: The ratio of administrative staff in a school system decreases as the number of schools in the school system increases.

Hypothesis three: The ratio of administrative staff in a school system decreases as the number of pupils in the school system increases.

Hypothesis four: There is no significant difference between the mean percentages of staff in administrative positions in groups of school systems of different sizes.

Alternate hypothesis four: There is a significant difference between the mean percentages of staff in administrative positions in groups of school systems of different sizes.

Hypothesis five: There is no significant difference between the mean percentages of staff in central office administrative positions in

groups of school systems of different sizes.

Alternate hypothesis five: There is a significant difference between the mean percentages of staff in central office administrative positions in groups of school systems of different sizes.

Hypothesis six: There is no significant difference in mean administrative staff per 1,000 pupils in groups of school systems of different sizes.

Alternate hypothesis six: There is a significant difference in mean administrative staff per 1,000 pupils in groups of school systems of different sizes.

Hypothesis seven: There is no significant difference in mean administrative staff per 100 teachers in groups of school systems of different sizes.

Alternate hypothesis seven: There is a significant difference in mean administrative staff per 100 teachers in groups of school systems of different sizes.

Hypothesis eight: There is no significant difference in mean total administrative staff per school in groups of school systems of different sizes.

Alternate hypothesis eight: There is a significant difference in mean total administrative staff per school in groups of school systems of different sizes.

Hypothesis nine: There is no significant difference in mean central office administrative staff per school in groups of school systems of different sizes.

Alternate hypothesis nine: There is a significant difference in mean central office administrative staff per school in groups of school systems of different sizes.

Hypothesis ten: There is no significant difference between the mean percentages of central office professional staff in groups of school systems of different sizes.

Alternate hypothesis ten: There is a significant difference between the mean percentages of central office professional staff in groups of school systems of different sizes.

Hypothesis eleven: There is no significant difference in the mean pupil-teacher ratio in groups of school systems of different sizes.

Alternate hypothesis eleven: There is a significant difference in the mean pupil-teacher ratio in groups of school systems of different sizes.

Hypothesis twelve: Each administrative office begins to occur consistently at a specific size of school system.

Directional hypotheses were formulated for the relationships between the ratio of administrative staff in a school system and the size of school system because the research summarized in the review of the literature in this chapter suggested the direction that these relationships would take.

Non-directional and alternate hypotheses were formulated for the examination of the various administrative ratios in groups of school systems of different sizes because of the lack of research evidence which could be used to predict the results.

Summary of Chapter II

The pertinent research on administrative ratios in business, industry, and education was reviewed. A number of generalizations and inconsistencies revealed in the various studies were summarized.

The lack of longitudinal studies of administrative ratios in school systems was noted.

Twelve hypotheses, based on research findings, were formulated to examine the relationship between the size of school systems and certain characteristics of their administrative staffs. Reasons were given for the choice of the different types of hypotheses which were proposed in this chapter.

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CHAPTER III

RESEARCH PROCEDURES

This chapter contains a description of the sample, the assumptions and limitations of the study, the methods and instruments used for data collection, and a summary of the statistical procedures which were used in this research.

The Sample

In this study an attempt was made to expand on a longitudinal basis, Gill's (1967) cross-sectional research on administrative ratios in urban school systems in the four western provinces of Canada. The sample consisted of forty-one urban school systems in the four western provinces of Canada, which were distributed as follows: eighteen in Alberta, nine in British Columbia, eight in Saskatchewan, and six in Manitoba. This is a similar sample to the one that was used by Gill (1967) in his study.

The sample was selected on the basis of certain desired characteristics. The first requirement was that the systems not be subject to close external control in the appointment of administrative staff. The second characteristic was that the system was largely responsible for its own administration in matters of provision of physical facilities for instruction, and for instruction itself, and that external authorities should not bear the responsibility for any substantial area of administration within the system. Third, the systems were urban. Here urban meant that the

school system included a town or city in its area of jurisdiction. The fourth requirement was that the systems administer both elementary and secondary education.

Forty-four systems in the four western provinces were asked to provide information for the study but only forty-two responded with data. Since the reply from one system was received too late to be included in the data analysis, the sample consisted of forty-one systems. Therefore, the sample used in this research consisted of 93.2 per cent of the school systems selected for the study.

The sample included most of the largest school systems in each of the four western provinces as well as urban systems with minimal numbers of administrative staff. All systems administered both elementary and secondary education and were urban in character.

Assumptions and Limitations of this Study

This study was dependent upon the accuracy of the information supplied by each of the school systems in the sample. The assumption was made that administrators in school systems correctly understood the nature of the information required, and supplied accurate data. Another assumption was that the superintendents interpreted the description of administrative offices in the same manner.

While this study was a longitudinal one, it only covered the five-year period 1964-65 to 1968-69 inclusive. While an expectation was held that some kind of curvilinear relationship might be established, emphasis should be placed on the fact that this may not represent the total growth curve, but rather the growth curve for the

five-year period.

The definition of administrative staff adopted limited the study to principals and central office staff. The sample was restricted to predominantly urban school systems in the western provinces of Canada.

Methods Used For Data Collection

The superintendent of each school system in the sample was asked to supply information on (a) the total numbers of schools, pupils, and teachers in the system for 1964-65 to 1968-69 inclusive, and (b) the numbers and positions of administrative staff in the school system for the years 1964-65 to 1968-69 inclusive. An explanatory letter (Appendix) which accompanied the data collection sheets described the research, contained a general description of positions to be included as administrative staff, and gave instructions on what to do if an amalgamation had occurred in the district in the period under study.

The data were limited to 1964-65 to 1968-69 inclusive as it was not considered feasible to ask school systems to provide data for a longer period due to the work involved and the large number of amalgamations which had occurred prior to 1964.

Instruments Used For Data Collection

The data collection sheets (Appendix) were the instruments used to obtain the required information. They were based on information gathered from the literature and included questions similar to those

in related studies.

As the data collection sheets approached final form they were submitted to twenty graduate students in the Department of Educational Administration for suggestions and criticisms. The consensus appeared to be that school systems could provide these data and that administrators could be identified by the terms used. The suggestions offered resulted in the addition of several questions which made the interpretation of the data more meaningful.

Analysis of Data

The raw data received from the superintendents of the forty-one school systems were organized into seventeen variables which are presented and described in Chapter IV. Administrative staff were identified and the size of each school system was determined according to the procedures outlined in Chapter I.

Pearson product-moment correlations were used to determine the relationships between (a) the ratio of total administrative staff and the total number of professional and administrative staff in the school systems, (b) the ratio of total administrative staff and the number of pupils in the school systems, and (c) the ratio of total administrative staff and the number of schools in the systems. A Pearson correlation was also used to determine the relationship between the ratio of central office administrative staff and the total number of professional and administrative staff in the systems. The findings were then compared with those of Gill (1967), and Anderson and Warkov (1961). All correlations obtained were tested for significance at the .05 level.

Since there were five years of data for each of the forty-one school systems, an N=205 was used for the correlation coefficients.

Analysis of variance was used to determine whether or not significant differences existed among groups of school systems of various sizes on the variables of percentage of staff in administrative positions, percentage of staff in central office administrative positions, administrative staff per 1,000 pupils, administrative staff per 100 teachers, administrative staff per school, central office administrative staff per school, and pupil-teacher ratio. In the analyses of variance an N=41 and the .10 alpha level were used to determine the significance of difference among groups of school systems of different sizes.

To compare results with Terrien and Mills (1955), and Gill (1967), mean percentages and standard deviations for the percentage of staff in administrative positions in groups of small, medium and large systems were calculated using the same size ranges as those used by Gill.

Administrative staff was expressed (a) as a staffing rate per 1,000 pupils, and (b) as a staffing rate per 100 teachers to facilitate comparison with Gittell's (1968) study.

To compare the findings of this study with the results of a study by Gill (1967), regression analysis was used to obtain a curve of best fit, which would enable prediction of total administrative staff from the size of the system in terms of the total professional and administrative staff. This analysis used Indik's (1964) approach

which assumes that the best approach to such a curve is by derivation of an exponential function of the form $x=e^{a-by}$, where x represents the size of the system in terms of the total professional and administrative staff, and y represents the percentage of staff in administrative positions.

Regression analysis was also used separately on each of the variables, from eleven to seventeen inclusive, to determine whether the relationship between each of these variables and the size of the school system in terms of the total professional and administrative staff was logarithmic, curvilinear, asymptotic, and of the form $x=e^{a-by}$.

A profile of the growth of the percentage of staff in administrative positions over the five-year time period of this study was plotted for each school system in the sample.

An attempt was made to establish threshold sizes for the occurrence of administrative offices in the forty-one school systems in the sample. These offices were listed in the order of frequency of occurrence and represented in graphical form against the size of school system in which they occurred.

Summary of Chapter III

In this study an attempt was made to expand Gill's (1967) cross-sectional research on administrative ratios on a longitudinal basis. The sample, which consisted of forty-one urban school systems, included most of the largest school systems in each of the four western provinces as well as systems in these provinces with minimal numbers

of administrative staff. All systems administered both elementary and secondary education and were urban in character.

The superintendent of each school system in the sample was asked to provide information on (a) the total numbers of schools, pupils, and teachers in the system for the school years 1964-65 to 1968-69 inclusive, and (b) the numbers and positions of administrative staff in the school system for the years 1964-65 to 1968-69 inclusive.

A summary was given of the statistical procedures which were used to examine the data.

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Indik, B. "The Relationship Between Organizational Size and Supervision Ratio," Administrative Science Quarterly, 1964, 9, 301-312.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The statistical analysis of the administrative ratios in the school systems in the sample is discussed in this chapter. The seventeen variables used in the study are presented and described, and eleven hypotheses are tested.

The raw data received from the superintendents of forty-one urban school systems in the four western provinces of Canada were organized into the nine variables shown in Table III. The computer was then programmed to generate a further eight variables from the original nine variables, making a total of seventeen variables. The eight variables generated from the original nine are shown in Table IV. Both of these tables incorporate data for the five school years 1964-65 to 1968-69 inclusive, for each school system in the sample. In the remainder of this thesis the seventeen variables are referred to by their identifying numbers. For example, variable (1) always refers to central office administrative staff.

Description of the Seventeen Variables

Variable (1): central office administrative staff. All personnel identified as administrative staff by the criteria proposed in Chapter I, and employed directly in or out of the central office of the school system, were categorized in this variable.[1]

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[1]Non-professional staff were not included in this study. That is, non-professional clerical, stores, equipment, maintenance, and transport personnel were excluded from this research.

TABLE III

YEARLY NUMBERS OF TEACHERS, ADMINISTRATORS, SCHOOLS, PUPILS, PRINCIPALS, AND PERCENTAGE OF STAFF IN ADMINISTRATIVE POSITIONS, FOR FORTY-ONE URBAN SCHOOL SYSTEMS IN WESTERN CANADA, FOR 1964-65 TO 1968-69 INCLUSIVE

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
AA1(1964-65)[a]	2	0	48	50	5	992.	5	7	43	14.00
AA2(1965-66)	2	0	46	48	5	1066	5	7	41	14.58
AA3(1966-67)	2	0	48	50	5	1155	5	7	43	14.00
AA4(1967-68)	2	0	48	50	5	1211	5	7	43	14.00
AA5(1968-69)	2	0	54	56	6	1302	6	8	48	14.29
AC1	3	0	55	48	2	1294	2	5	53	8.62
AC2	3	0	60	63	2	1409	2	5	58	7.94
AC3	4	0	65	69	2	1380	2	6	63	8.70
AC4	4	0	67	71	3	1382	3	7	64	9.86
AC5	3	0	67	70	3	1476	3	6	64	8.57
AB1	2	0	63	65	3	1293	3	5	60	7.69
AB2	2	0	65	67	3	1259	3	5	62	7.46
AB3	2	0	66	68	3	1272	3	5	63	7.35
AB4	2	0	71	73	3	1339	3	5	68	6.85
AB5	2	0	75	77	3	1436	3	5	72	6.49
AE1	4	0	62	66	4	1420	1	5	61	7.58
AE2	4	0	68	72	4	1472	1	5	67	6.94
AE3	4	0	72	76	4	1559	1	5	71	6.58

[a]In the identifier the first letter refers to the province--A=Alberta, B=British Columbia, S=Saskatchewan, and M=Manitoba, and the second letter refers to a particular school system in that province. In the identifier the numbers 1 to 5 indicate the data years 1964-65 to 1968-69.

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
AE4	5	0	75	80	4	1575	2	7	73	8.75
AE5	5	0	77	82	4	1550	2	7	75	8.54
AF1	2	0	54	56	6	1275	6	8	48	14.29
AF2	3	0	60	63	6	1376	6	9	54	14.29
AF3	4	0	70	74	7	1466	7	11	63	14.86
AF4	5	0	79	84	7	1612	7	12	72	14.29
AF5	4	0	83	87	7	1691	7	11	76	12.64
AG1	2	0	62	64	5	1433	2	4	60	6.25
AG2	2	0	67	69	6	1461	2	4	65	5.80
AG3	3	0	79	82	6	1648	2	5	77	6.10
AG4	3	0	82	85	6	1682	5	8	77	9.41
AG5	3	0	85	88	5	1706	5	8	80	9.09
AH1	4	0	81	85	7	1868	7	11	74	12.94
AH2	5	0	84	89	7	1949	7	12	77	13.48
AH3	6	0	88	94	6	2056	6	12	82	12.77
AH4	6	0	96	102	6	2094	6	12	90	11.76
AH5	5	0	100	105	6	2148	6	11	94	10.48
AI1	5	0	126	131	13	2857	12	17	114	12.98
AI2	5	0	130	135	13	2774	12	17	118	12.59
AI3	5	0	126	131	13	2665	12	17	114	12.98
AI4	4	0	125	129	13	2662	12	16	113	12.40
AI5	4	0	125	129	13	2653	12	16	113	12.40

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
AD1	3	0	62	65	4	1250	4	7	58	10.77
AD2	6	0	81	87	5	1588	5	11	76	12.64
AD3	6	0	103	109	5	1843	5	11	98	10.09
AD4	6	0	113	119	5	2001	5	11	108	9.24
AD5	6	0	124	130	5	2150	5	11	119	8.46
AK1	1	0	123	124	9	2477	8	9	115	7.26
AK2	3	0	124	127	9	2468	8	11	116	8.66
AK3	3	0	129	132	9	2396	8	11	121	8.33
AK4	4	0	132	136	9	2546	8	12	124	8.82
AK5	4	0	134	138	9	2685	9	13	125	9.42
AJ1	3	0	110	113	7	2215	7	10	103	8.85
AJ2	3	0	116	119	7	2360	7	10	109	8.40
AJ3	4	0	131	135	7	2506	7	11	124	8.15
AJ4	4	0	141	145	7	2587	7	11	134	7.59
AJ5	3	0	140	143	7	2680	7	10	133	6.99
AL1	8	1	237	246	15	5231	15	23	222	9.35
AL2	9	1	243	253	15	5270	15	24	228	9.49
AL3	9	2	257	268	15	5336	15	24	242	8.96
AL4	9	2	268	279	15	5287	15	24	253	8.60
AL5	10	2	279	291	15	5416	15	25	264	8.59
AM1	9	0	222	231	16	5275	16	25	206	10.82
AM2	10	2	259	271	17	5674	17	27	242	9.96
AM3	10	2	277	289	17	5995	17	27	260	9.34
AM4	12	2	298	312	17	6122	17	29	281	9.29
AM5	12	3	308	323	18	6120	18	30	290	9.29

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
AN1	9	0	299	308	15	7148	15	24	284	7.79
AN2	9	0	314	323	15	7201	15	24	299	7.43
AN3	9	0	321	330	15	7163	15	24	306	7.27
AN4	9	1	336	346	15	7208	15	24	321	6.94
AN5	11	1	339	351	15	7385	15	26	324	7.41
AP1	14	4	511	529	40	13168	41	55	470	10.40
AP2	17	6	598	621	41	14752	41	58	557	9.34
AP3	24	9	719	752	45	16225	45	69	674	9.18
AP4	27	12	814	853	50	17673	50	77	764	9.03
AP5	35	14	860	909	52	18931	52	87	808	9.57
AQ1	25	2	889	916	63	21703	63	88	826	9.61
AQ2	28	1	992	1021	63	23417	63	91	929	8.91
AQ3	41	2	1138	1181	67	25525	67	108	1071	9.14
AQ4	50	3	1282	1335	69	27442	69	119	1213	8.91
AQ5	51	6	1423	1480	72	29273	72	123	1351	8.31
AR1	38	14	2602	2654	117	62019	117	155	2485	5.84
AR2	58	24	2749	2831	118	64541	118	176	2631	6.22
AR3	65	28	2979	3072	126	67036	126	191	2853	6.22
AR4	96	34	3154	3284	131	68973	131	227	3023	6.91
AR5	96	34	3372	3502	138	71827	138	234	3234	6.68
AS1	57	3	2281	2341	125	56147	125	182	2156	7.77
AS2	73	4	2617	2694	135	61767	134	207	2483	7.68
AS3	91	12	2910	3013	141	65300	136	227	2774	7.53
AS4	121	24	3194	3339	145	68942	145	266	3049	7.97
AS5	138	28	3534	3700	151	72344	151	289	3383	7.81

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
BA1	6	0	215	221	30	5418	29	35	186	15.84
BA2	7	0	213	220	25	5663	24	31	189	14.09
BA3	8	0	237	245	24	6009	23	31	214	12.65
BA4	9	0	254	263	24	6375	23	32	231	12.17
BA5	10	0	261	271	24	6453	23	33	238	12.18
BI1	9	0	330	339	32	8424	32	41	298	12.09
BI2	12	0	386	398	33	9535	33	45	353	11.31
BI3	12	0	435	447	33	10425	33	45	402	10.07
BI4	12	1	473	486	33	11250	33	45	440	9.26
BI5	11	1	536	548	34	12104	34	45	502	8.21
BB1	7	2	435	444	37	12136	18	25	417	5.63
BB2	8	3	485	496	37	13073	19	27	466	5.44
BB3	9	4	511	524	38	13843	19	28	492	5.34
BB4	10	5	552	567	40	14564	22	32	530	5.64
BB5	10	6	600	616	41	15439	23	33	577	5.36
BD1	12	1	485	498	34	13601	31	43	454	8.63
BD2	12	1	557	570	36	15287	35	47	522	8.25
BD3	13	1	656	670	38	17677	36	49	620	7.31
BD4	16	2	747	765	38	19660	37	53	710	6.93
BD5	17	2	885	904	40	22246	39	56	846	6.19
BC1	17	2	634	653	35	17164	35	52	599	7.96
BC2	18	2	703	723	36	18270	36	54	667	7.47
BC3	18	4	752	774	39	19344	39	57	713	7.36
BC4	19	4	823	846	39	20166	39	58	784	6.86
BC5	22	5	883	910	40	20747	40	62	843	6.81

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
BE1	20	2	769	791	62	20872	40	60	729	7.59
BE2	20	2	837	859	65	21916	41	61	796	7.10
BE3	20	2	907	929	68	23547	41	61	866	6.57
BE4	20	4	961	985	68	24918	43	63	918	6.40
BE5	21	5	1048	1074	69	26360	42	63	1006	5.87
BF1	17	0	922	939	44	24508	43	60	879	6.39
BF2	17	0	965	982	47	25433	43	60	922	6.11
BF3	17	0	1029	1046	49	26221	43	60	986	5.74
BF4	17	0	1085	1102	49	26803	44	61	1041	5.54
BF5	17	0	1130	1147	49	27254	44	61	1086	5.32
BG1	28	3	1009	1040	49	27727	43	71	966	6.83
BG2	30	3	1071	1104	50	27231	44	74	1025	6.70
BG3	32	3	1145	1178	55	30281	47	77	1098	6.54
BG4	32	7	1232	1271	56	30793	49	81	1183	6.37
BG5	43	12	1332	1387	55	32111	52	95	1280	6.85
BH1	53	3	2686	2730	80	68343	80	133	2606	4.87
BH2	53	3	2798	2844	80	70260	80	133	2718	4.68
BH3	57	4	2921	2970	83	72507	83	140	2838	4.71
BH4	65	5	3042	3100	84	74098	84	149	2958	4.81
BH5	65	7	3076	3137	85	74488	85	150	2991	4.78
MA1	4	0	129	133	9	2953	9	13	120	9.77
MA2	4	0	129	133	9	2866	9	13	120	9.77
MA3	4	0	132	136	9	2820	9	13	123	9.56
MA4	5	0	135	140	10	2749	10	15	125	10.71
MA5	5	0	137	142	10	2811	10	15	127	10.56

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
MB1	5	1	86	92	6	1941	6	11	80	11.96
MB2	5	1	91	97	6	1985	6	11	85	11.34
MB3	5	1	97	103	6	2028	6	11	91	10.68
MB4	7	1	132	140	9	2801	9	16	123	11.43
MB5	7	1	163	171	9	3186	9	16	154	9.36
MC1	4	2	284	290	14	6635	14	18	270	6.21
MC2	5	2	298	305	14	6618	14	19	284	6.23
MC3	6	2	308	316	13	6554	13	19	295	6.01
MC4	7	4	323	334	14	6714	14	21	309	6.29
MC5	7	4	335	346	15	6978	15	22	320	6.36
MD1	4	2	239	245	9	6158	9	13	230	5.31
MD2	4	2	269	275	10	6636	10	14	259	5.09
MD3	6	4	298	308	11	7096	11	17	287	5.52
MD4	8	5	358	371	12	8025	12	20	346	5.39
MD5	9	6	385	400	13	8450	13	22	372	5.50
MF1	10	3	353	366	13	8816	12	22	341	6.01
MF2	10	3	369	382	13	8897	12	22	357	5.76
MF3	9	5	378	392	13	9115	12	21	366	5.36
MF4	12	5	471	488	15	11313	15	27	456	5.53
MF5	21	8	486	515	16	11340	16	37	470	7.18
ME1	47	72	1922	2041	79	49103	63	110	1859	5.39
ME2	48	78	1964	2090	79	49031	63	111	1901	5.31
ME3	49	88	1998	2135	80	48631	65	114	1933	5.34
ME4	52	97	2102	2251	80	49063	67	120	2035	5.33
ME5	56	114	2189	2359	79	49382	68	124	2121	5.26

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
SA1	3	0	47	50	4	1241	4	7	43	14.00
SA2	4	0	55	59	4	1289	4	8	51	13.56
SA3	4	0	57	61	4	1347	4	8	53	13.11
SA4	4	0	58	62	4	1306	4	8	54	12.90
SA5	4	0	60	64	4	1295	4	8	56	12.50
SB1	1	0	75	76	8	1738	3	4	72	5.26
SB2	1	0	76	77	8	1808	3	4	73	5.19
SB3	2	0	78	80	8	1954	3	5	75	6.25
SB4	2	0	88	90	9	2046	3	5	85	5.56
SB5	2	0	103	105	9	2203	3	5	100	4.76
SC1	4	0	133	137	8	3236	8	12	125	8.76
SC2	4	0	142	146	8	3410	8	12	134	8.22
SC3	5	0	152	157	8	3542	8	13	144	8.28
SC4	6	0	167	173	9	3773	10	16	157	9.25
SC5	7	0	178	185	9	3787	10	17	168	9.19
SD1	6	1	211	218	13	4860	14	20	197	9.17
SD2	7	1	223	231	13	5000	14	21	209	9.09
SD3	9	1	230	240	14	5050	15	24	215	10.00
SD4	9	1	252	262	14	5250	15	24	237	9.16
SD5	11	2	254	267	14	5400	15	26	239	9.74
SE1	12	0	230	242	19	6397	19	31	211	12.81
SE2	14	0	253	267	21	6973	21	35	232	13.11
SE3	17	0	278	295	21	7482	21	38	257	12.88
SE4	18	0	298	316	22	7921	22	40	276	12.66
SE5	18	0	309	327	22	8256	22	40	287	12.23

TABLE III (continued)

Variable No.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
School system identifier	Central office admin. staff	Central office prof. staff	No. of teachers (includes principals)	No. of teachers and C.O. staff	No. of schools	No. of pupils	No. of principals	No. of admin. staff	No. of teachers (excludes principals)	Percentage of staff in admin. positions
SH1	8	0	197	205	20	4979	19	27	178	13.17
SH2	12	0	232	244	21	5438	18	30	214	12.30
SH3	12	0	267	279	22	5945	21	33	246	11.83
SH4	13	0	285	298	22	6788	22	35	263	11.74
SH5	16	0	316	332	23	7446	22	38	294	11.45
SF1	5	0	311	316	15	7376	15	20	296	6.33
SF2	5	0	314	319	15	7194	15	20	299	6.27
SF3	10	0	334	344	16	7484	15	25	319	7.27
SF4	14	0	349	363	16	7551	16	30	333	8.26
SF5	14	0	364	378	16	7554	16	30	348	7.94
SG1	33	2	836	871	51	21958	51	84	785	9.64
SG2	33	2	884	919	52	22552	52	85	832	9.25
SG3	33	2	909	944	55	22732	55	88	854	9.32
SG4	33	2	941	976	57	23135	57	90	884	9.22
SG5	33	2	972	1007	59	24096	59	92	913	9.14

TABLE IV

YEARLY NUMBERS AND PERCENTAGES OF TOTAL ADMINISTRATIVE STAFF, CENTRAL OFFICE ADMINISTRATIVE STAFF, CENTRAL OFFICE PROFESSIONAL STAFF, AND PUPIL-TEACHER RATIOS, FOR FORTY-ONE URBAN SCHOOL SYSTEMS IN WESTERN CANADA, FOR 1964-65 TO 1968-69 INCLUSIVE

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier[a]	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
AA1 (1964-65)	14.00	4.00	7.06	16.28	1.40	0.40	0.00	23.07
AA2 (1965-66)	14.58	4.17	6.57	17.07	1.40	0.40	0.00	26.00
AA3 (1966-67)	14.00	4.00	6.06	16.28	1.40	0.40	0.00	26.86
AA4 (1967-68)	14.00	4.00	5.78	16.28	1.40	0.40	0.00	28.16
AA5 (1968-69)	14.29	3.57	6.14	16.67	1.33	0.40	0.00	27.13
AC1	8.62	5.17	3.86	9.43	2.50	1.50	0.00	24.42
AC2	7.94	4.76	3.55	8.62	2.50	1.50	0.00	24.29
AC3	8.70	5.80	4.35	9.52	3.00	2.00	0.00	21.90
AC4	9.86	5.63	5.07	10.94	2.33	1.33	0.00	21.59
AC5	8.57	4.29	4.07	9.37	2.00	1.00	0.00	23.06
AB1	7.69	3.08	3.87	8.33	1.67	0.67	0.00	21.55
AB2	7.46	2.99	3.97	8.06	1.67	0.67	0.00	20.31
AB3	7.35	2.94	3.93	7.94	1.67	0.67	0.00	20.19
AB4	6.85	2.74	3.73	7.35	1.67	0.67	0.00	19.69
AB5	6.49	2.60	3.48	6.94	1.67	0.67	0.00	19.94
AE1	7.58	6.06	3.52	8.20	1.25	1.00	0.00	23.28
AE2	6.94	5.56	3.40	7.46	1.25	1.00	0.00	21.97
AE3	6.58	5.26	3.21	7.04	1.25	1.00	0.00	21.96
AE4	8.75	6.25	4.44	9.59	1.75	1.25	0.00	21.58
AE5	8.54	6.10	4.52	9.33	1.75	1.25	0.00	20.67

[a]In the identifier the first letter refers to the province--A=Alberta, B=British Columbia, M=Manitoba, and S=Saskatchewan, and the second letter refers to a particular school system in that province. In the identifier the numbers 1 to 5 indicate the data years 1964-65 to 1968-69.

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
AF1	14.29	3.57	6.27	16.67	1.33	0.33	0.00	26.56
AF2	14.29	4.76	6.54	16.67	1.50	0.50	0.00	25.48
AF3	14.86	5.41	7.50	17.46	1.57	0.57	0.00	23.27
AF4	14.29	5.95	7.44	16.67	1.71	0.71	0.00	22.39
AF5	12.64	4.60	6.51	14.47	1.57	0.57	0.00	22.25
AG1	6.25	3.12	2.79	6.67	0.80	0.40	0.00	23.88
AG2	5.80	2.90	2.74	6.15	0.67	0.33	0.00	22.48
AG3	6.10	3.66	3.03	6.49	0.83	0.50	0.00	21.40
AG4	9.41	3.53	4.76	10.39	1.33	0.50	0.00	21.84
AG5	9.09	3.41	4.69	10.00	1.60	0.60	0.00	21.32
AH1	12.94	4.71	5.89	14.86	1.57	0.57	0.00	25.24
AH2	13.48	5.62	6.16	15.58	1.71	0.71	0.00	25.31
AH3	12.77	6.38	5.84	14.63	2.00	1.00	0.00	25.07
AH4	11.76	5.88	5.73	13.33	2.00	1.00	0.00	23.27
AH5	10.48	4.76	5.12	11.70	1.83	0.83	0.00	22.85
AI1	12.98	3.82	5.95	14.91	1.31	0.38	0.00	25.06
AI2	12.59	3.70	6.13	14.41	1.31	0.38	0.00	23.51
AI3	12.98	3.82	6.38	14.91	1.31	0.38	0.00	23.38
AI4	12.40	3.10	6.01	14.16	1.23	0.31	0.00	23.56
AI5	12.40	3.10	6.03	14.16	1.23	0.31	0.00	23.48
AD1	10.77	4.62	5.60	12.07	1.75	0.75	0.00	21.55
AD2	12.64	6.90	6.93	14.47	2.20	1.20	0.00	20.89
AD3	10.09	5.50	5.97	11.22	2.20	1.20	0.00	18.81
AD4	9.24	5.04	5.50	10.19	2.20	1.20	0.00	18.53
AD5	8.46	4.62	5.12	9.24	2.20	1.20	0.00	18.07

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
AK1	7.26	0.81	3.63	7.83	1.00	0.11	0.00	21.54
AK2	8.66	2.36	4.46	9.48	1.22	0.33	0.00	21.28
AK3	8.33	2.27	4.59	9.09	1.22	0.33	0.00	19.80
AK4	8.82	2.94	4.71	9.68	1.33	0.44	0.00	20.53
AK5	9.42	2.90	4.84	10.40	1.44	0.44	0.00	21.48
AJ1	8.85	2.65	4.51	9.71	1.43	0.43	0.00	21.50
AJ2	8.40	2.52	4.24	9.17	1.43	0.43	0.00	21.65
AJ3	8.15	2.96	4.39	8.87	1.57	0.57	0.00	20.21
AJ4	7.59	2.76	4.25	8.21	1.57	0.57	0.00	19.31
AJ5	6.99	2.10	3.73	7.52	1.43	0.43	0.00	20.15
AL1	9.35	3.25	4.40	10.36	1.53	0.53	0.41	23.56
AL2	9.49	3.56	4.55	10.53	1.60	0.60	0.40	23.11
AL3	8.96	3.36	4.50	9.92	1.60	0.60	0.75	22.05
AL4	8.60	3.23	4.54	9.49	1.60	0.60	0.72	20.60
AL5	8.59	3.44	4.62	9.47	1.67	0.67	0.69	20.52
AM1	10.82	3.90	4.74	12.14	1.56	0.56	0.00	25.61
AM2	9.96	3.69	4.76	11.16	1.59	0.59	0.74	23.45
AM3	9.34	3.46	4.50	10.38	1.59	0.59	0.69	23.06
AM4	9.29	3.85	4.74	10.32	1.71	0.71	0.64	21.79
AM5	9.29	3.72	4.90	10.34	1.67	0.67	0.93	21.10
AN1	7.79	2.92	3.36	8.45	1.60	0.60	0.00	25.17
AN2	7.43	2.79	3.33	8.03	1.60	0.60	0.00	24.08
AN3	7.27	2.73	3.35	7.84	1.60	0.60	0.00	23.41
AN4	6.94	2.60	3.33	7.48	1.60	0.60	0.29	22.45
AN5	7.41	3.13	3.52	8.02	1.73	0.73	0.28	22.79

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
AP1	10.40	2.65	4.18	11.70	1.37	0.35	0.76	28.02
AP2	9.34	2.74	3.93	10.41	1.41	0.41	0.97	26.48
AP3	9.18	3.19	4.25	10.24	1.53	0.53	1.20	24.07
AP4	9.03	3.17	4.36	10.08	1.54	0.54	1.41	23.13
AP5	9.57	3.85	4.60	10.77	1.67	0.67	1.54	23.43
AQ1	9.61	2.73	4.05	10.65	1.40	0.40	0.22	26.27
AQ2	8.91	2.74	3.89	9.80	1.44	0.44	0.10	25.21
AQ3	9.14	3.47	4.23	10.08	1.61	0.61	0.17	23.83
AQ4	8.91	3.75	4.34	9.81	1.72	0.72	0.22	22.62
AQ5	8.31	3.45	4.20	9.10	1.71	0.71	0.41	21.67
AR1	5.84	1.43	2.50	6.24	1.32	0.32	0.53	24.96
AR2	6.22	2.05	2.73	6.69	1.49	0.49	0.85	24.53
AR3	6.22	2.12	2.85	6.69	1.52	0.52	0.91	23.50
AR4	6.91	2.92	3.29	7.51	1.73	0.73	1.04	22.82
AR5	6.68	2.74	3.26	7.24	1.70	0.70	0.97	22.21
AS1	7.77	2.43	3.24	8.44	1.46	0.46	0.13	26.04
AS2	7.68	2.71	3.35	8.34	1.53	0.54	0.15	24.88
AS3	7.53	3.02	3.48	8.18	1.61	0.65	0.40	23.54
AS4	7.97	3.62	3.86	8.72	1.83	0.83	0.72	22.61
AS5	7.81	3.73	3.99	8.54	1.91	0.91	0.76	21.38
BA1	15.84	2.71	6.46	18.82	1.17	0.20	0.00	29.13
BA1	14.09	3.18	5.47	16.40	1.24	0.28	0.00	29.96
BA3	12.65	3.27	5.16	14.49	1.29	0.33	0.00	28.08
BA4	12.17	3.42	5.02	13.85	1.33	0.38	0.00	27.60
BA5	12.18	3.69	5.11	13.87	1.37	0.42	0.00	27.11

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
BI1	12.09	2.65	4.87	13.76	1.28	0.28	0.00	28.27
BI2	11.31	3.02	4.72	12.75	1.36	0.36	0.00	27.01
BI3	10.07	2.68	4.32	11.19	1.36	0.36	0.00	25.93
BI4	9.26	2.47	4.00	10.23	1.36	0.36	0.21	25.57
BI5	8.21	2.01	3.72	8.96	1.32	0.32	0.18	24.11
BB1	5.63	1.58	2.06	6.00	0.68	0.19	0.45	29.10
BB2	5.44	1.61	2.07	5.79	0.73	0.22	0.60	28.05
BB3	5.34	1.72	2.02	5.69	0.74	0.24	0.76	28.14
BB4	5.64	1.76	2.20	6.04	0.80	0.25	0.88	27.48
BB5	5.36	1.62	2.14	5.72	0.80	0.24	0.97	26.76
BD1	8.63	2.41	3.16	9.47	1.26	0.35	0.20	29.96
BD2	8.25	2.11	3.07	9.00	1.31	0.33	0.18	29.29
BD3	7.31	1.94	2.77	7.90	1.29	0.34	0.15	28.51
BD4	6.93	2.09	2.70	7.46	1.39	0.42	0.26	27.69
BD5	6.19	1.88	2.52	6.62	1.40	0.42	0.22	26.30
BC1	7.96	2.60	3.03	8.68	1.49	0.49	0.31	28.65
BC2	7.47	2.49	2.96	8.10	1.50	0.50	0.28	27.39
BC3	7.36	2.33	2.95	7.99	1.46	0.46	0.52	27.13
BC4	6.86	2.25	2.88	7.40	1.49	0.49	0.47	25.72
BC5	6.81	2.42	2.99	7.35	1.55	0.55	0.55	24.61
BE1	7.59	2.53	2.87	8.23	0.97	0.32	0.25	28.63
BE2	7.10	2.33	2.78	7.66	0.94	0.31	0.23	27.53
BE3	6.57	2.15	2.59	7.04	0.90	0.29	0.22	27.19
BE4	6.40	2.03	2.53	6.86	0.93	0.29	0.41	27.14
BE5	5.87	1.96	2.39	6.26	0.91	0.30	0.47	26.20

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
BF1	6.39	1.81	2.45	6.83	1.36	0.39	0.00	27.88
BF2	6.11	1.73	2.36	6.51	1.28	0.36	0.00	27.58
BF3	5.74	1.63	2.29	6.09	1.22	0.35	0.00	26.59
BF4	5.54	1.54	2.28	5.86	1.24	0.35	0.00	25.75
BF5	5.32	1.48	2.24	5.62	1.24	0.35	0.00	25.10
BG1	6.83	2.69	2.56	7.35	1.45	0.57	0.29	28.70
BG2	6.70	2.72	2.72	7.22	1.48	0.60	0.27	26.57
BG3	6.54	2.55	2.54	7.01	1.40	0.55	0.25	27.58
BG4	6.37	2.52	2.63	6.85	1.45	0.57	0.55	26.03
BG5	6.85	3.10	2.96	7.42	1.73	0.78	0.87	25.09
BH1	4.87	1.94	1.95	5.10	1.66	0.66	0.11	26.23
BH2	4.68	1.86	1.89	4.89	1.66	0.66	0.11	25.85
BH3	4.71	1.92	1.93	4.93	1.69	0.69	0.13	25.55
BH4	4.81	2.10	2.01	5.04	1.77	0.77	0.16	25.05
BH5	4.78	2.07	2.01	5.02	1.76	0.76	0.22	24.90
MA1	9.77	3.01	4.40	10.83	1.44	0.44	0.00	24.61
MA2	9.77	3.01	4.54	10.83	1.44	0.44	0.00	23.88
MA3	9.56	2.94	4.61	10.57	1.44	0.44	0.00	22.93
MA4	10.71	3.57	5.46	12.00	1.50	0.50	0.00	21.99
MA5	10.56	3.52	5.34	11.81	1.50	0.50	0.00	22.13
MB1	11.96	5.43	5.67	13.75	1.83	0.83	1.09	24.26
MB2	11.34	5.15	5.54	12.94	1.83	0.83	1.03	23.35
MB3	10.68	4.85	5.42	12.09	1.83	0.83	0.97	22.29
MB4	11.43	5.00	5.71	13.01	1.78	0.78	0.71	22.77
MB5	9.36	4.09	5.02	10.39	1.78	0.78	0.58	20.69

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
MC1	6.21	1.38	2.71	6.67	1.29	0.29	0.69	24.57
MC2	6.23	1.64	2.87	6.69	1.36	0.36	0.66	23.30
MC3	6.01	1.90	2.90	6.44	1.46	0.46	0.63	22.22
MC4	6.29	2.10	3.13	6.80	1.50	0.50	1.20	21.73
MC5	6.36	2.02	3.15	6.87	1.47	0.47	1.16	21.81
MD1	5.31	1.63	2.11	5.65	1.44	0.44	0.82	26.77
MD2	5.09	1.45	2.11	5.41	1.40	0.40	0.73	25.62
MD3	5.52	1.95	2.40	5.92	1.55	0.55	1.30	24.72
MD4	5.39	2.16	2.49	5.78	1.67	0.67	1.35	23.19
MD5	5.50	2.25	2.60	5.91	1.69	0.69	1.50	22.72
MF1	6.01	2.73	2.50	6.45	1.69	0.77	0.82	25.85
MF2	5.76	2.62	2.47	6.16	1.69	0.77	0.79	24.92
MF3	5.36	2.30	2.30	5.74	1.62	0.69	1.28	24.90
MF4	5.53	2.46	2.39	5.92	1.80	0.80	1.02	24.81
MF5	7.18	4.08	3.26	7.87	2.31	1.31	1.55	24.13
ME1	5.39	2.30	2.24	5.92	1.39	0.59	3.53	26.41
ME2	5.31	2.30	2.26	5.84	1.41	0.61	3.73	25.79
ME3	5.34	2.30	2.34	5.90	1.42	0.61	4.12	25.16
ME4	5.33	2.31	2.45	5.90	1.50	0.65	4.31	24.11
ME5	5.26	2.37	2.51	5.85	1.57	0.71	4.83	23.28
SA1	14.00	6.00	5.64	16.28	1.75	0.75	0.00	28.86
SA2	13.56	6.78	6.21	15.69	2.00	1.00	0.00	25.27
SA3	13.11	6.56	5.94	15.09	2.00	1.00	0.00	25.42
SA4	12.90	6.45	6.13	14.81	2.00	1.00	0.00	24.19
SA5	12.50	6.25	6.18	14.29	2.00	1.00	0.00	23.12

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
SB1	5.26	1.32	2.30	5.56	0.50	0.13	0.00	24.14
SB2	5.19	1.30	2.21	5.48	0.50	0.13	0.00	24.77
SB3	6.25	2.50	2.56	6.67	0.63	0.25	0.00	26.05
SB4	5.56	2.22	2.44	5.88	0.56	0.22	0.00	24.07
SB5	4.76	1.90	2.27	5.00	0.56	0.22	0.00	22.03
SC1	8.76	2.92	3.71	9.60	1.50	0.50	0.00	25.89
SC2	8.22	2.74	3.52	8.96	1.50	0.50	0.00	25.45
SC3	8.28	3.18	3.67	9.03	1.62	0.63	0.00	24.60
SC4	9.25	3.47	4.24	10.19	1.78	0.67	0.00	24.03
SC5	9.19	3.78	4.49	10.12	1.89	0.78	0.00	22.54
SD1	9.17	2.75	4.12	10.15	1.54	0.46	0.46	24.67
SD2	9.09	3.03	4.20	10.05	1.62	0.54	0.43	23.92
SD3	10.00	3.75	4.75	11.16	1.71	0.64	0.42	23.49
SD4	9.16	3.44	4.57	10.13	1.71	0.64	0.38	22.15
SD5	9.74	4.12	4.81	10.88	1.86	0.79	0.75	22.59
SE1	12.81	4.96	4.85	14.69	1.63	0.63	0.00	30.32
SE2	13.11	5.24	5.02	15.09	1.67	0.67	0.00	30.06
SE3	12.88	5.76	5.08	14.79	1.81	0.81	0.00	29.11
SE4	12.66	5.70	5.05	14.49	1.82	0.82	0.00	28.70
SE5	12.23	5.50	4.84	13.94	1.82	0.82	0.00	28.77

TABLE IV (continued)

Variable No.	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
School system identifier	% of staff in admin. positions	C.O. admin. staff as % of total prof. and admin. staff	No. of admin. staff per 1,000 pupils	No. of admin. staff per 100 teachers	No. of admin. staff per school	No. of C.O. admin. staff per school	C.O. prof. staff as % of total prof. and admin. staff	Pupil-teacher ratio
SH1	13.17	3.90	5.42	15.17	1.35	0.40	0.00	27.97
SH2	12.30	4.92	5.52	14.02	1.43	0.57	0.00	25.41
SH3	11.83	4.30	5.55	13.41	1.50	0.55	0.00	24.17
SH4	11.74	4.36	5.16	13.31	1.59	0.59	0.00	25.81
SH5	11.45	4.82	5.10	12.93	1.65	0.70	0.00	25.33
SF1	6.33	1.58	2.71	6.76	1.33	0.33	0.00	24.92
SF2	6.27	1.57	2.78	6.69	1.33	0.33	0.00	24.06
SF3	7.27	2.91	3.34	7.84	1.56	0.63	0.00	23.46
SF4	8.26	3.86	3.97	9.01	1.87	0.88	0.00	22.68
SF5	7.94	3.70	3.97	8.62	1.87	0.88	0.00	21.71
SG1	9.64	3.79	3.83	10.70	1.65	0.65	0.23	27.97
SG2	9.25	3.59	3.77	10.22	1.63	0.63	0.22	27.11
SG3	9.32	3.50	3.87	10.30	1.60	0.60	0.21	26.62
SG4	9.22	3.38	3.89	10.18	1.58	0.58	0.20	26.17
SG5	9.14	3.28	3.82	10.08	1.56	0.56	0.20	26.39

Variable (2): central office professional staff. Specialist, non-administrative, professional personnel, such as psychologists and social workers, who were employed in or out of central office were categorized in this variable. Their primary task was to work with children. They did not exercise any significant interpersonal supervision of staff in the system.

Variable (3): number of teachers including principals. All university-trained or equivalent personnel, who were employed as members of school staffs were categorized here. Included were classroom teachers, assistant and vice-principals, department heads, principals, librarians, and guidance officers, who were employed in schools.

Variable (4): number of teachers and central office staff. This variable measured the total number of professional and administrative personnel employed in schools throughout the system and at central office. Its value, which was obtained by totalling the first three variables, represents the size of the school system. The eighteen Alberta systems in the sample ranged from size 56 to size 3700 with most of the systems falling near the smaller end of this range. The nine systems from British Columbia ranged from size 548 to size 3137 with most of the systems falling near the centre of this range. Except for one school system in each province, all of the systems in Manitoba and Saskatchewan were smaller than size 516. (Table III)

Variable (5): number of schools. The total number of schools in

a school system, from primary-elementary to senior high inclusive, was categorized here.

Variable (6): number of pupils. This variable measured the total number of pupils in all grades in a school system, from kindergarten to senior high inclusive.

Variable (7): number of principals. The total number of principals of all schools in a system, from primary-elementary to senior high inclusive was measured in this variable.

Variable (8): number of administrative staff. The total administrative staff of a school system was obtained by adding the central office administrative staff (variable 1) to the number of principals (variable 7).

Variable (9): number of teachers excluding principals. This variable was similar to variable (3) except that the principals of schools were excluded. It was necessary for the calculation of the pupil-teacher ratio.

Variable (10): percentage of staff in administrative positions. This was the ratio of the total number of administrative staff (variable 8) to the size of the school system in terms of the total number of professional and administrative staff (variable 4), expressed as a percentage.

Variable (11): percentage of staff in central office administrative positions. In this variable, the ratio of the central office

administrative staff (variable 1) to the size of the school system (variable 4), was expressed as a percentage.

Variable (12): number of administrative staff per 1,000 pupils. This was the ratio of the total number of administrative staff (variable 8) per 1,000 pupils.

Variable (13): number of administrative staff per 100 teachers. This was the ratio of the total number of administrative staff in a school system (variable 8) per 100 teachers.

Variable (14): number of administrative staff per school. In this variable, the total administrative staff of a school system (variable 8) was expressed as a staffing rate per school.

Variable (15): number of central office administrative staff per school. In this variable, the central office administrative staff was expressed as a staffing rate per school.

Variable (16): percentage of staff in central office professional positions. The ratio of central office professional staff (variable 2) to the size of the school system (variable 4), was expressed as a percentage in this variable.

Variable (17): pupil-teacher ratio. The pupil-teacher ratio was obtained by dividing the total number of pupils in a school system (variable 6) by the total number of teachers, excluding principals, in a school system (variable 9).

Testing of Hypotheses One, Two and Three

Hypothesis one. The ratio of administrative staff in a school system decreases as the total number of professional and administrative staff increases.

The Pearson correlation coefficient between the ratio of administrative staff (variable 10) and the total number of professional and administrative staff (variable 4), was -0.426, which was significant at the .001 level. (Table V)[2] Therefore, hypothesis one was accepted.

The results obtained from the testing of hypothesis one provides confirming evidence for Gill's (1967:44) finding that administrative proportion (i. e. ratio) and school system size are significantly negatively correlated in certain urban school systems in western Canada.

Hypothesis two. The ratio of administrative staff in a school system decreases as the number of schools in the system increases.

The Pearson correlation coefficient between the ratio of administrative staff (variable 10) and the number of schools (variable 5) was -0.353, which was significant at the .001 level. (Table V) Therefore, hypothesis two was accepted.

Hypothesis three. The ratio of administrative staff in a school system decreases as the number of pupils in the school system increases.

The Pearson correlation coefficient between the ratio of administrative staff (variable 10) and the number of pupils (variable 6)

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[2]An N=205 was used for all correlation coefficients in Table V as there were five years of data for each of the forty-one school systems in the sample.

TABLE V

INTERCORRELATION AND PROBABILITY MATRIX FOR SEVENTEEN CONTINUOUS VARIABLES FOR FORTY-ONE URBAN SCHOOL SYSTEMS IN WESTERN CANADA FOR 1964-65 TO 1968-69 INCLUSIVE

Variable	(1) Central office admin. staff		(2) Central office prof. staff		(3) No. of teachers (includes principals)		(4) Number of teachers and C.O. staff		(5) Number of schools		(6) Number of pupils	
	r	p	r	p	r	p	r	p	r	p	r	p
(1)	1.000	0.000	0.515	0.000	0.940	0.000	0.943	0.000	0.928	0.000	0.917	0.000
(2)			1.000	0.000	0.532	0.000	0.546	0.000	0.487	0.000	0.524	0.000
(3)					1.000	0.000	0.995	0.000	0.947	0.000	0.991	0.000
(4)							1.000	0.000	0.947	0.000	0.991	0.000
(5)									1.000	0.000	0.941	0.000
(6)											1.000	0.000
(7)												
(8)												
(9)												
(10)												
(11)												
(12)												
(13)												
(14)												
(15)												
(16)												
(17)												

TABLE V (continued)

Variable	(7) Number of principals		(8) Number of admin. staff		(9) No. of teachers (excludes principals)		(10) % of staff in admin. positions		(11) C.O. admin. staff as % of total prof. and admin. staff		(12) No. of admin. staff per 1,000 pupils	
	r	p	r	p	r	p	r	p	r	p	r	p
(1)	0.942	0.000	0.976	0.000	0.938	0.000	-0.296	0.000	-0.190	0.006	-0.319	0.000
(2)	0.447	0.000	0.481	0.000	0.535	0.000	-0.284	0.000	-0.179	0.010	-0.272	0.000
(3)	0.949	0.000	0.958	0.000	0.995	0.000	-0.428	0.000	-0.349	0.000	-0.461	0.000
(4)	0.950	0.000	0.959	0.000	0.995	0.000	-0.426	0.000	-0.345	0.000	-0.458	0.000
(5)	0.982	0.000	0.973	0.000	0.943	0.000	-0.353	0.000	-0.357	0.000	-0.421	0.000
(6)	0.939	0.000	0.942	0.000	0.991	0.000	-0.442	0.000	-0.373	0.000	-0.489	0.000
(7)	1.000	0.000	0.986	0.000	0.945	0.000	-0.305	0.000	-0.318	0.000	-0.365	0.000
(8)			1.000	0.000	0.955	0.000	-0.305	0.000	-0.270	0.000	-0.351	0.000
(9)					1.000	0.000	-0.432	0.000	-0.350	0.000	-0.464	0.000
(10)							1.000	0.000	0.691	0.000	0.940	0.000
(11)									1.000	0.000	0.741	0.000
(12)											1.000	0.000
(13)												
(14)												
(15)												
(16)												
(17)												

TABLE V (continued)

Variable	(13) No. of admin. staff per 100 teachers		(14) No. of admin. staff per school		(15) No. of C.O. admin. staff per school		(16) C.O. prof. staff as % of total prof. and admin. staff		(17) Pupil-teacher ratio	
	r	p	r	p	r	p	r	p	r	p
(1)	-0.291	0.000	0.122	0.083	0.080	0.255	0.361	0.000	0.081	1.153
(2)	-0.267	0.000	0.009	0.899	0.041	0.560	0.887	0.000	0.002	0.973
(3)	-0.420	0.000	0.025	0.717	-0.020	0.778	0.383	0.000	0.138	0.049
(4)	-0.417	0.000	0.028	0.693	-0.016	0.815	0.396	0.000	0.135	0.053
(5)	-0.348	0.000	-0.080	0.252	-0.129	0.065	0.346	0.000	0.240	0.001
(6)	-0.433	0.000	0.003	0.962	-0.040	0.572	0.380	0.000	0.189	0.007
(7)	-0.301	0.000	0.004	0.955	-0.085	0.224	0.302	0.000	0.198	0.005
(8)	-0.301	0.000	0.052	0.457	-0.019	0.791	0.331	0.000	0.152	0.029
(9)	-0.424	0.000	0.026	0.708	-0.017	0.808	0.389	0.000	0.135	0.054
(10)	0.995	0.000	0.266	0.000	0.109	0.119	-0.347	0.000	0.119	0.089
(11)	0.686	0.000	0.594	0.000	0.698	0.000	-0.232	0.001	-0.176	0.012
(12)	0.936	0.000	0.362	0.000	0.230	0.001	-0.329	0.000	-0.199	0.004
(13)	1.000	0.000	0.258	0.000	0.102	0.144	-0.329	0.000	0.129	0.065
(14)			1.000	0.000	0.863	0.000	0.018	0.796	-0.315	0.000
(15)					1.000	0.000	0.031	0.664	-0.374	0.000
(16)							1.000	0.000	0.001	0.988
(17)									1.000	0.000

was -0.442, which was significant at the .001 level. (Table V) Therefore, hypothesis three was accepted.

The results of the testing of hypothesis one, two and three appeared to indicate, for certain urban school systems in western Canada, the percentage of staff in administrative positions was significantly negatively correlated with the total professional and administrative staff in a school system, the total number of pupils in a school system, and the total number of schools in a school system.

In order to compare the results of this study with those of Gill (1967:44-45), the ratio of central office administrative staff (variable 11) was correlated with the size of the school system in terms of the total professional and administrative staff (variable 4). The Pearson correlation coefficient for these two variables was -0.345 which was significant at the .001 level. (Table V) This was similar to the result obtained by Gill (1967:44-45).

Testing Hypothesis Four

In order to compare the findings of this study with those of Terrien and Mills (Table I), and Gill (Table II), the school systems were categorized by size, on the basis of variable four, the total professional and administrative staff in a school system (Table III), into small, medium, and large systems, using the size range 0-249 for small systems, 250-999 for medium systems, and 1,000 and over for large systems. On this basis analysis of variance[3] was applied to variable ten, the percentage of staff in administrative positions.

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[3]An N=41 systems was used in all of the analyses of variance reported in this chapter.

Hypothesis four. There is no significant difference between the mean percentage of staff in administrative positions in groups of school systems of different sizes.

The probability level of 0.011 for the obtained F ratio for the distribution in Table VI showed that at least one significant difference occurred between pairs of means of the three groups. Alternate hypothesis four, that there is a significant difference between the mean percentages of staff in administrative positions in groups of school systems of different sizes, was therefore accepted.

The difference between the mean percentage of staff in administrative positions for groups small and large was shown by the Scheffé test[4] to be significant at the 0.011 level. (Table VI) Inspection of the means in Tables VI and VII showed that, among the school systems used in this study, the systems categorized as large had a smaller mean percentage of staff in administrative positions that systems categorized as medium size, and the largest mean percentage of staff in administrative positions was found in the smaller systems.

Comparison of Tables VI and VII with Tables I and II appeared to suggest that the results of the comparison of mean percentages of staff in groups of school systems of different sizes in this study,

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[4]Ferguson (1959:296-297) states that the Scheffé procedure is more rigorous than other procedures, and will lead to fewer significant results. Because this is so, the investigator may choose to use the 0.10 level of significance instead of the 0.05 level, as was done in the analyses of variance in this study. The Scheffé test is suitable for grossly different n's in categories, and for consistency of evidence where categories are almost the same.

TABLE VI

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in admin. positions	Standard deviation
Small	16	56-185	9.61	2.49
Medium	16	267-910	8.38	2.22
Large	9	1007-3700	6.67	1.51
F	5.13	p 0.011		

TABLE VII

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
Small and Medium	9.61	8.38	0.299
Small and Large	9.61	6.67	0.011
Medium and Large	8.38	6.67	0.193

provided supportive evidence for Gill's findings (Table II) and non-supportive evidence for Terrien and Mills' results (Table I).

Three attempts were made to check this finding by dividing the forty-one school systems in this study into groups of school systems of size ranges 56-185, 267-616, 904-3700, and 56-143, 171-400, 515-1480, 2359-3700, and 56-143, 171-400, 515-1147, 1387-3700, on the basis of variable four, the total professional and administrative staff. In each of the three attempts analysis of variance was applied to variable ten, the percentage of staff in administrative positions. The results of all three analyses of variance (Tables VIII to XIII), appeared to support the previous finding that groups of larger school systems have smaller mean percentages of staff in administrative positions than groups of smaller systems.

The Testing of Hypotheses Five to Eleven

On the basis of variable four, the total number of professional and administrative staff in a school system, the forty-one school systems in the sample were divided into four groups of school systems of size ranges 56-143, 171-400, 515-1147, and 1387-3700. Analysis of variance was then applied to each of the variables, from eleven to seventeen inclusive. Summaries of the analyses of variance used on these seven variables are shown in Tables XIV to XXV.

Hypothesis five. There is no significant difference between the mean percentages of staff in central office administrative positions in groups of school systems of different sizes.

The probability level of 0.025 for the obtained F ratio for the

TABLE VIII

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in admin. positions	Standard deviation
1	16	56-185	9.61	2.49
2	13	267-616	8.57	2.33
3	12	904-3700	6.88	1.55
F	5.27	p 0.010		

TABLE IX

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	9.61	8.57	0.459
1 and 3	9.61	6.88	0.010
2 and 3	8.57	6.88	0.173

TABLE X

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in admin. positions	Standard deviation
1	14	56-143	9.66	2.67
2	12	171-400	9.10	2.14
3	11	515-1480	7.16	1.47
4	4	2359-3700	6.13	1.38
F	4.71	p 0.007		

TABLE XI

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	9.66	9.10	0.934
1 and 3	9.66	7.16	0.055
1 and 4	9.66	6.13	0.054
2 and 3	9.10	7.16	0.215
2 and 4	9.10	6.13	0.144
3 and 4	7.16	6.13	0.878

TABLE XII

COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in admin. positions	Standard deviation
1	14	56-143	9.66	2.67
2	12	171-400	9.10	2.14
3	9	515-1147	7.07	1.59
4	6	1387-3700	6.62	1.38
F	4.48	p 0.009		

TABLE XIII

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	9.66	9.10	0.935
1 and 3	9.66	7.07	0.066
1 and 4	9.66	6.62	0.055
2 and 3	9.10	7.07	0.227
2 and 4	9.10	6.62	0.170
3 and 4	7.07	6.62	0.983

distribution in Table XIV showed that at least one significant difference occurred between pairs of means of the four groups. Alternate hypothesis five, that there is a significant difference between the mean percentages of staff in central office administrative positions in groups of school systems of different sizes, was therefore accepted.

The difference between the mean percentage of staff in central office administrative positions for means one and three was shown by the Scheffé test to be significant at the 0.056 level. (Table XV)

Inspection of the means in Table XIV showed that the smaller systems had higher mean percentages of staff in central office administrative positions than did the larger systems. This relationship appeared to be curvilinear as category 4 (systems greater than 1386 professional and administrative staff) had a higher mean percentage of staff in central office administrative positions than did category 3.

Hypothesis six. There is no significant difference in mean administrative staff per 1,000 pupils in groups of school systems of different sizes.

The probability level of 0.000 for the obtained F ratio for the distribution in Table XVI showed that at least one significant difference occurred between pairs of means of the four groups. Alternate hypothesis six, that there is a significant difference in mean administrative staff per 1,000 pupils in groups of school systems of different sizes, was therefore accepted.

TABLE XIV

COMPARISON OF MEAN PERCENTAGES OF STAFF IN CENTRAL OFFICE ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in C.O. admin. positions	Standard deviation
1	14	56-143	3.84	1.34
2	12	171-400	3.69	0.96
3	9	515-1147	2.51	0.99
4	6	1387-3700	2.91	0.64
F	3.49	p 0.025		

TABLE XV

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF STAFF IN CENTRAL OFFICE ADMINISTRATIVE POSITIONS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	3.84	3.69	0.989
1 and 3	3.84	2.51	0.056
1 and 4	3.84	2.91	0.389
2 and 3	3.69	2.51	0.124
2 and 4	3.69	2.91	0.562
3 and 4	2.51	2.91	0.919

TABLE XVI

COMPARISON OF MEAN ADMINISTRATIVE STAFF PER 1,000 PUPILS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean admin. staff per 1,000 pupils	Standard deviation
1	14	56-143	4.86	1.19
2	12	171-400	4.34	0.84
3	9	515-1147	3.08	0.84
4	6	1387-3700	3.16	0.84
F	8.18	p 0.000		

TABLE XVII

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN ADMINISTRATIVE STAFF PER 1,000 PUPILS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	4.86	4.34	0.621
1 and 3	4.86	3.08	0.002
1 and 4	4.86	3.16	0.011
2 and 3	4.34	3.08	0.049
2 and 4	4.34	3.16	0.136
3 and 4	3.08	3.16	0.999

The Scheffé test showed that there were three significant differences between pairs of groups. The difference between means 1 and 3 was significant at the 0.002 level, the difference between means 1 and 4 was significant at the 0.011 level, and the difference between means 2 and 3 was significant at the 0.049 level. (Table XVII)

Examination of the means in Table XVII showed that the smaller systems had a higher mean administrative staff per 1,000 pupils than did the larger systems. This relationship appeared to be curvilinear as category 4 (systems greater than 1386 professional and administrative staff) had a higher mean administrative staff per 1,000 pupils than did category 3.

Hypothesis seven. There is no significant difference in mean administrative staff per 100 teachers in groups of school systems of different sizes.

The probability level of 0.011 for the obtained F ratio for the distribution in Table XVIII showed that at least one significant difference occurred between pairs of means of the four groups. Alternate hypothesis seven, that there is a significant difference in mean administrative staff per 100 teachers in groups of school systems of different sizes, was therefore accepted.

The Scheffé test, in Table XIX, showed that the difference between means 1 and 3 was significant at the 0.071 level, and that the difference between means 1 and 4 was significant at the 0.064 level.

Inspection of the means in Table XVIII showed that smaller school systems had a higher mean administrative staff per 100 teachers than did the larger systems.

TABLE XVIII

COMPARISON OF MEAN ADMINISTRATIVE STAFF PER 100 TEACHERS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean admin. staff per 100 teachers	Standard deviation
1	14	56-143	10.78	3.28
2	12	171-400	10.11	2.57
3	9	515-1147	7.69	1.88
4	6	1387-3700	7.20	1.55
F	4.30	p 0.011		

TABLE XIX

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN ADMINISTRATIVE STAFF PER 100 TEACHERS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	10.78	10.11	0.936
1 and 3	10.78	7.69	0.071
1 and 4	10.78	7.20	0.064
2 and 3	10.11	7.69	0.239
2 and 4	10.11	7.20	0.192
3 and 4	7.69	7.20	0.988

Hypothesis eight. There is no significant difference in mean total administrative staff per school in groups of school systems of different sizes.

The probability level of 0.191 for the obtained F ratio for the distribution of Table XX revealed that there were no significant differences between pairs of means of the four groups. Therefore, hypothesis eight was accepted.

Hypothesis nine. There is no significant difference in mean central office administrative staff per school in groups of school systems of different sizes.

The probability level of 0.324 for the obtained F ratio for the distribution of Table XXII indicated that there were no significant differences between pairs of means of the four groups. Hypothesis nine was therefore accepted.

Hypothesis ten. There is no significant difference in the mean percentages of central office professional staff in groups of school systems of different sizes.

The probability level of 0.007 for the obtained F ratio for the distribution in Table XXIV showed that at least one significant difference occurred between pairs of means of the four groups. Alternate hypothesis ten, that there is a significant difference in mean percentage of central office professional staff in groups of school systems of different sizes, was therefore accepted.

The Scheffé test in Table XXV showed that the difference between means 1 and 4 was significant at the 0.009 level.

TABLE XX

COMPARISON OF MEAN ADMINISTRATIVE STAFF PER SCHOOL IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean admin. staff per school	Standard deviation
1	14	56-143	1.58	0.40
2	12	171-400	1.71	0.16
3	9	515-1147	1.42	0.44
4	6	1387-3700	1.73	0.11
F	1.67	p 0.191		

TABLE XXI

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN ADMINISTRATIVE STAFF PER SCHOOL IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES[a]

Groups	Means		Probability
1 and 2	1.58	1.71	0.807
1 and 3	1.58	1.42	0.727
1 and 4	1.58	1.73	0.831
2 and 3	1.71	1.42	0.282
2 and 4	1.71	1.73	0.999
3 and 4	1.42	1.73	0.371

[a]In Tables XX and XXI the administrative component is analyzed as a staffing rate per school, in groups of systems of different sizes.

TABLE XXII

COMPARISON OF MEAN CENTRAL OFFICE ADMINISTRATIVE STAFF PER SCHOOL IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean C.O. admin. staff per school	Standard deviation
1	14	56-143	0.67	0.34
2	12	171-400	0.70	0.14
3	9	515-1147	0.52	0.33
4	6	1387-3700	0.76	0.08
F	1.20	p 0.324		

TABLE XXIII

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN CENTRAL OFFICE ADMINISTRATIVE STAFF PER SCHOOL IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	0.67	0.70	0.992
1 and 3	0.67	0.52	0.655
1 and 4	0.67	0.76	0.910
2 and 3	0.70	0.52	0.520
2 and 4	0.70	0.76	0.974
3 and 4	0.52	0.76	0.413

TABLE XXIV

COMPARISON OF MEAN PERCENTAGES OF CENTRAL OFFICE PROFESSIONAL STAFF IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean percentage of staff in C.O. prof. positions	Standard deviation
1	14	56-143	0.00	0.00
2	12	171-400	0.49	0.52
3	9	515-1147	0.63	0.59
4	6	1387-3700	1.34	1.73
F	4.69	p 0.007		

TABLE XXV

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PERCENTAGES OF CENTRAL OFFICE PROFESSIONAL STAFF IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	0.00	0.49	0.439
1 and 3	0.00	0.63	0.291
1 and 4	0.00	1.34	0.009
2 and 3	0.49	0.63	0.980
2 and 4	0.49	1.34	0.179
3 and 4	0.63	1.34	0.368

Inspection of the means in Table XXIV showed that smaller systems had lower mean percentages of staff in central office professional positions than did the larger systems. This relationship appeared to be curvilinear as category 4 (systems greater than 1386 professional and administrative staff) had a higher mean percentage of staff in central office professional positions than did category 3.

Hypothesis eleven. There is no significant difference in the mean pupil-teacher ratio in groups of school systems of different sizes.

The probability level of 0.008 for the obtained F ratio for the distribution in Table XXVI showed that at least one significant difference occurred between pairs of means of the four groups. Alternate hypothesis eleven, that there is a significant difference in mean pupil-teacher ratios in groups of school systems of different sizes, was therefore accepted.

The difference between the mean pupil-teacher ratios for groups 1 and 3 was shown by the Scheffé test, in Table XXVII, to be significant at the 0.008 level. Inspection of the means in Table XXVI appeared to indicate that the mean pupil-teacher ratios increased from groups of smaller size school systems, and then decreased in the groups of the largest school systems. This relationship appeared to be curvilinear.

The graphs in Figure 1 illustrate the comparison of the means of variables ten to seventeen in groups of school systems of different sizes. The information plotted in Figure 1 was taken from the analyses of variance discussed above.

TABLE XXVI

COMPARISON OF MEAN PUPIL-TEACHER RATIOS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Group	Number of school systems in group	Size range of school systems (Total number of teachers plus C.O. prof. and admin. staff)	Mean pupil-teacher ratio	Standard deviation
1	14	56-143	21.98	2.10
2	12	171-400	23.14	2.59
3	9	515-1147	25.23	1.22
4	6	1387-3700	23.09	1.61
F	4.57	p 0.008		

TABLE XXVII

PROBABILITY MATRIX FOR SCHEFFÉ MULTIPLE COMPARISON OF MEAN PUPIL-TEACHER RATIOS IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES

Groups	Means		Probability
1 and 2	21.98	23.14	0.565
1 and 3	21.98	25.23	0.008
1 and 4	21.98	23.09	0.748
2 and 3	23.14	25.23	0.171
2 and 4	23.14	23.09	1.000
3 and 4	25.23	23.09	0.290

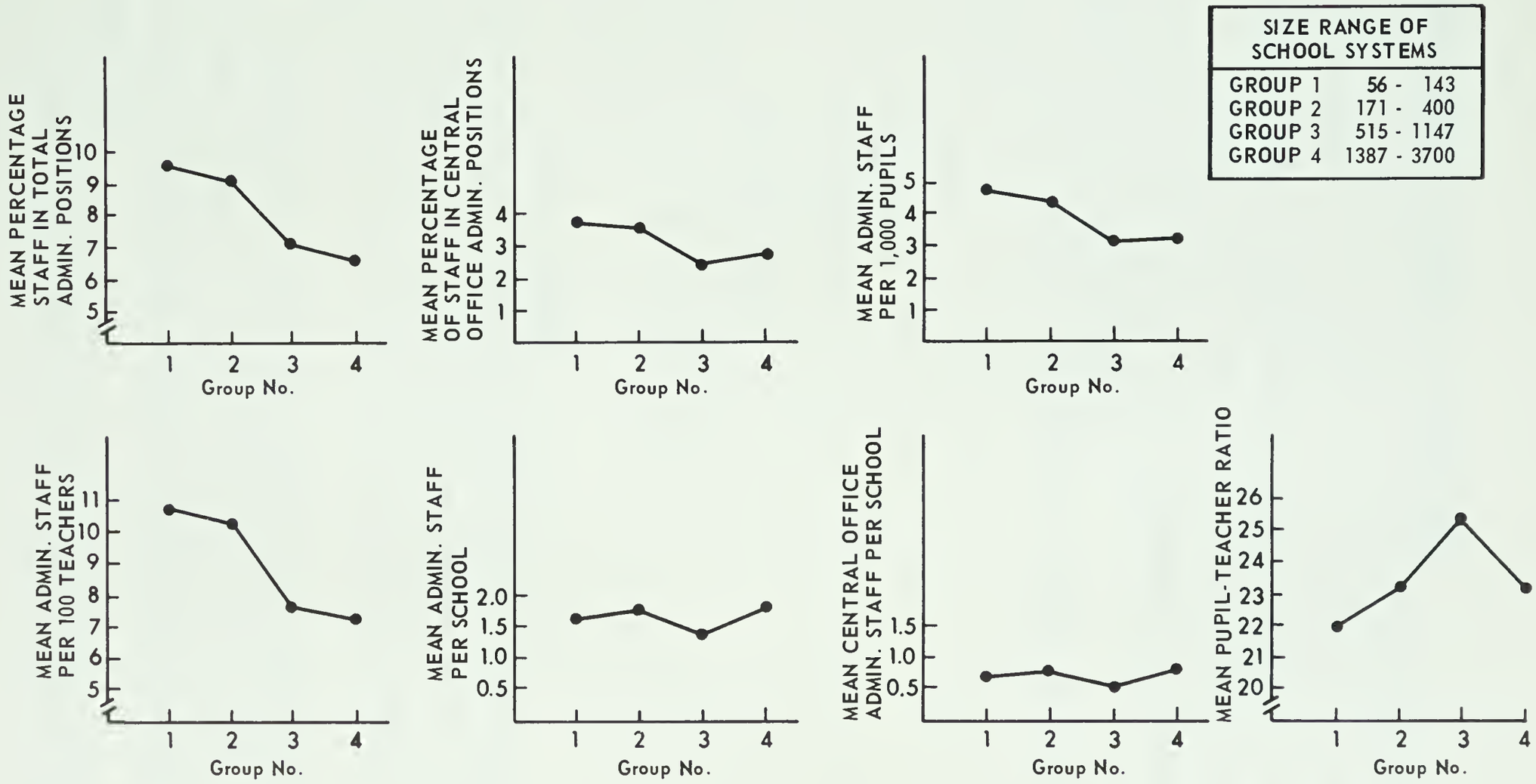

FIGURE 1: COMPARISON OF THE MEANS OF VARIABLES 10, 11, 12, 13, 14 15, 17 IN GROUPS OF SCHOOL SYSTEMS OF DIFFERENT SIZES (N = 41 SYSTEMS)

Multiple Regression Analysis on Variable (10)

As was mentioned in Chapters II and III, Indik (1964:301-309) and Gill (1967:45) both suggested that the relationship between the percentage of staff in administrative positions (variable 10) and the size of the school system in terms of the total professional and administrative staff (variable 4) was logarithmic, curvilinear, asymptotic, and of the form $x=e^{a-by}$.

An alternate form of the mathematical model $x=e^{a-by}$ is derived as follows:

$$x=e^{a-by}$$

$$\log_e x=a-by$$

$$by=a-\log_e x$$

$$y=\frac{a}{b}-\frac{1}{b}(\log_e x)$$

Substituting C_1 for $\frac{a}{b}$ and C_2 for $-\frac{1}{b}$,

this expression,

$$y=C_1+C_2\log_e x,$$

provides an alternate mathematical model for the relationship between the percentage of staff in administrative positions and the size of the school system in terms of the total professional and administrative staff.

In this model x represents the size of the school system in terms of the total professional and administrative staff (variable 4) and y represents the percentage of staff in administrative positions (variable 10).

The above model was used, and multiple regression analysis was

applied to the data, separately for each of the five school years 1964-65 to 1968-69 inclusive, and to all five school years combined.

The results of the analysis (Table XXVII) indicated that for each year separately, and for the five years combined, the data conformed to the predicted model. For each year separately, and for all five years combined, this relationship was significant at greater than the 0.01 level. That is, for forty-one urban school systems in western Canada, the relationship between the percentage of staff in administrative positions and the size of the school system in terms of the total professional and administrative staff, was logarithmic, curvilinear, asymptotic, and of the form $x=e^{a-by}$.

Figure 2 illustrates that, when the relationship between the percentage of staff in administrative positions and the size of the school system in terms of the total professional and administrative staff were plotted on a semilogarithmic grid, and a line of best fit drawn, this line appeared as a straight line of negative slope.

Multiple Regression Analysis on Variables (11) to (17)

Multiple regression analysis was used separately on each of the seven variables, from eleven to seventeen inclusive, to determine whether or not the relationship between each of these variables and the size of the school system in terms of the total professional and administrative staff (variable 4), was logarithmic, curvilinear, asymptotic, and of the form $x=e^{a-by}$. In other words, an attempt was made to find out if the relationship which was found to exist between the percentage of staff in administrative positions (variable 10) and the size of the school system (Variable 4), also applied to the

TABLE XXVIII

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE PERCENTAGE OF STAFF IN ADMINISTRATIVE POSITIONS AND THE SIZE OF SCHOOL SYSTEMS

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	15.4584	-1.1496	1	39	10.0546	0.0030
1965-66	41	15.5483	-1.1888	1	39	11.3096	0.0017
1966-67	41	15.2426	-1.1541	1	39	12.8277	0.0009
1967-68	41	15.9435	-1.2479	1	39	18.8854	0.0001
1968-69	41	14.8821	-1.0965	1	39	15.6166	0.0003
1964-68	205	15.4425	-1.1722	1	203	69.3473	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=percentage of staff in administrative positions (variable 10), and x=size of school system (variable 4).

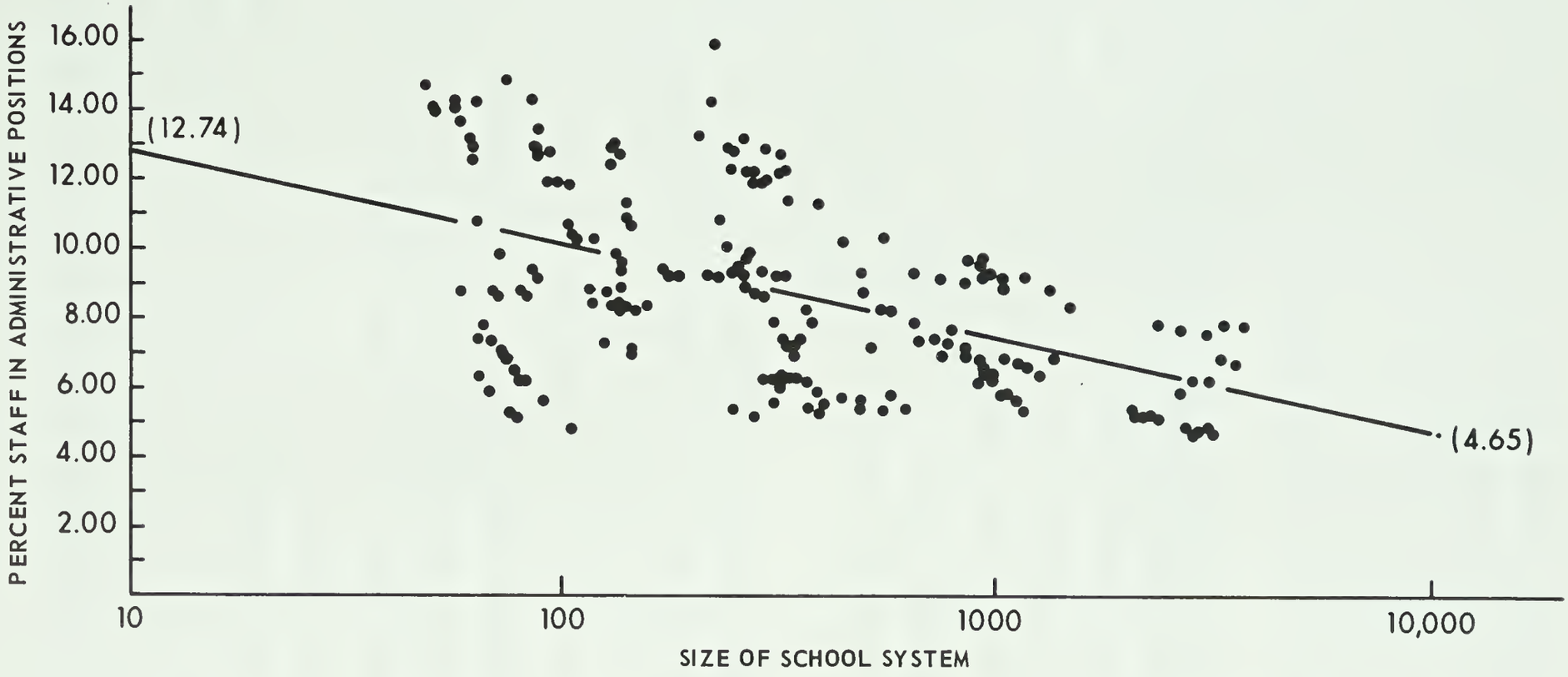

FIGURE 2: YEARLY PERCENTAGES OF STAFF IN ADMINISTRATIVE POSITIONS IN FORTY-ONE URBAN SCHOOL SYSTEMS DURING THE SCHOOL YEARS 1964 - 65 TO 1968 - 69 INCLUSIVE

relationship between the size of the school system (variable 4), and each of the seven variables, from eleven to seventeen inclusive.

The model $x=e^{a-by}$ was used and multiple regression analysis was applied to the data, separately for each of the five school years 1964-65 to 1968-69 inclusive for each variable, and to all five school years combined for each variable.

The results of these multiple regression analyses were summarized in Tables XXIX to XXXV. A brief statement about the relationship that was found between the size of school system (variable 4), and each of the seven variables, from eleven to seventeen inclusive, is given below. Throughout the multiple regression analysis the size of the school system refers to the total number of professional and administrative staff (variable 4).

The results of the multiple regression analysis (Table XXIX) indicated that, for each year separately, and for the five years combined, the relationship between the percentage of staff in central office administrative positions (variable 11) and the size of the school system (variable 4) conformed to the predicted model and was logarithmic, curvilinear, asymptotic, and of the form $x=e^{a-by}$. For each year separately and for all five years combined this relationship was significant at greater than the 0.01 level. C_2 on Table XXIX, which always determines the slope of the curve, indicated that the curvilinear relationship between variables eleven and four was negative.

The multiple regression analysis (Table XXX) showed that, for each year separately and for all five years combined, the relationship

TABLE XXIX

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE PERCENTAGE OF STAFF IN CENTRAL OFFICE ADMINISTRATIVE POSITIONS AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	6.3102	-0.5841	1	39	15.2808	0.0004
1965-66	41	6.9245	-0.6551	1	39	15.8241	0.0003
1966-67	41	7.27-3	-0.6840	1	39	21.5336	0.0000
1967-68	41	7.0277	-0.6184	1	39	16.6619	0.0002
1968-69	41	5.9610	-0.4445	1	39	9.7557	0.0034
1964-68	205	6.6138	-0.5819	1	203	74.7439	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=percentage of staff in central office administrative positions (variable 11), and x=size of school system (variable 4).

TABLE XXX

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE NUMBER OF ADMINISTRATIVE STAFF PER 1,000 PUPILS AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	7.6970	-0.6797	1	39	19.2429	0.0001
1965-66	41	7.9109	-0.7030	1	39	19.3799	0.0001
1966-67	41	7.9501	-0.6943	1	39	20.7950	0.0001
1967-68	41	8.3525	-0.7313	1	39	28.9636	0.0000
1968-69	41	7.7875	-0.6378	1	39	24.4201	0.0000
1964-68	205	7.8755	-0.6778	1	203	109.8131	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=number of administrative staff per 1,000 pupils (variable 12), and x=size of school system (variable 4).

between the number of administrative staff per 1,000 pupils (variable 12) and the size of the school system (variable 4) conformed to the predicted model, and was logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and negative in slope. For each year separately and for all five years combined, this relationship was significant at greater than the 0.01 level.

The multiple regression analysis (Table XXXI) indicated that, for each year separately and for all five years combined, the relationship between the number of administrative staff per 100 teachers (variable 13) and the size of the school system (variable 4), conformed to the predicted model, and was logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and negative in slope. For each year separately and for all five years combined, this relationship was significant at greater than the 0.01 level.

The multiple regression analysis (Table XXXII) revealed that, the relationship between the number of administrative staff per school (variable 14) and the size of the school system (variable 4), did not fit the predicted model. None of the F ratics obtained in the analysis was significant at the 0.05 level or greater. Therefore, the relationship between variables fourteen and four is not of the form $x=e^{a-by}$.

Inspection of the multiple regression analysis (Table XXXIII) indicated that the relationship between the number of central office administrative staff per school (variable 15) and the size of the school system (variable 4), also did not fit the predicted model. In order to examine the data for all five years together it was necessary

TABLE XXXI

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE NUMBER OF ADMINISTRATIVE STAFF PER 100 TEACHERS AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	17.8945	-1.4001	1	39	9.7976	0.0033
1965-66	41	18.0194	-1.4503	1	39	11.2156	0.0018
1966-67	41	17.5566	-1.3940	1	39	12.5275	0.0011
1967-68	41	18.3361	-1.4967	1	39	18.3523	0.0001
1968-69	41	16.9827	-1.3021	1	39	15.0534	0.0004
1964-68	205	17.7943	-1.4147	1	203	67.5246	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=number of administrative staff per 100 teachers (variable 13), and x=size of school system (variable 4).

TABLE XXXII

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE NUMBER OF ADMINISTRATIVE STAFF PER SCHOOL AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	1.5332	-0.0218	1	39	0.2348	0.6306
1965-66	41	1.6400	-0.0321	1	39	0.4406	0.5107
1966-67	41	1.8404	-0.0568	1	39	1.1436	0.2914
1967-68	41	1.7628	-0.0321	1	39	0.5016	0.4830
1968-69	41	1.6471	-0.0075	1	39	0.0268	0.8706
1964-68	205	1.6510	-0.0241	1	203	1.2808	0.2591

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=number of administrative staff per school (variable 14), and x=size of school system (variable 4).

TABLE XXXIII

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE NUMBER OF CENTRAL OFFICE ADMINISTRATIVE STAFF PER SCHOOL AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	0.7591	-0.0471	1	39	1.9791	0.1674
1965-66	41	0.8779	-0.0585	1	39	2.7815	0.1034
1966-67	41	1.0614	-0.0792	1	39	3.8863	0.0558
1967-68	41	0.8886	-0.0428	1	39	1.5301	0.2235
1968-69	41	0.7348	-0.0129	1	39	0.1305	0.7199
1964-68	205	0.8362	-0.0429	1	203	7.0173	0.0087

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=number of central office administrative staff per school (variable 15), and x= size of school system (variable 4).

to use an N=205. Since this may have had the effect of biasing the results, the data for each school year were run separately, using an N=41 for each year. Therefore, since the multiple regression analysis between variables fifteen and four resulted in F ratios that were not significant at the 0.05 level or greater, for four out of five data years, the conclusion was reached that the relationship between the central office administrative staff per school (variable 15) and the size of school system (variable 4) was not of the form $x=e^{a-by}$.

The multiple regression analysis (Table XXXIV) showed that, for each school year separately and for all five years combined, the relationship between the percentage of staff in central office professional positions (variable 16) and the size of the school system (variable 4), conformed to the predicted model, and was logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and positive in slope. For each year separately and for all five school years combined this relationship was significant at the 0.01 level or greater than the 0.01 level.

Inspection of the multiple regression analysis (Table XXXV) indicated that the relationship between the pupil-teacher ratio (variable 17) and the size of the school system (variable 4), conformed to the predicted model, and was logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and positive in slope. Five of the six F ratios in Table XXXV were significant at greater than the 0.04 level, while the F ratio for the 1968-69 data year was significant at the 0.056 level. This may indicate that there is a tendency for the 1968-69 data to depart from the predicted model.

TABLE XXXIV

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE PERCENTAGE OF STAFF IN CENTRAL OFFICE PROFESSIONAL POSTIONS AND THE SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	-0.8166	0.1970	1	39	6.8115	0.0128
1965-66	41	-0.9098	0.2159	1	39	7.3717	0.0098
1966-67	41	-0.0747	0.2531	1	39	7.9052	0.0077
1967-68	41	-1.3653	0.3087	1	39	11.8072	0.0014
1968-69	41	-1.5495	0.3475	1	39	12.0273	0.0013
1964-68	205	-1.1604	0.2685	1	39	48.6001	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=percentage of staff in central office professional (non-administrative) positions (variable 16), and x=size of school system (variable 4).

TABLE XXXV

RESULTS OF THE USE OF MULTIPLE REGRESSION ANALYSIS TO FIT A LINEAR LOGARITHMIC CURVE[a] TO THE CORRELATIONS BETWEEN THE PUPIL-TEACHER RATIO AND SIZE OF SCHOOL SYSTEM

School year	N	C_1	C_2	df num.	df den.	F ratio	Probability
1964-65	41	20.5515	0.9607	1	39	10.9131	0.0020
1965-66	41	20.1979	0.8630	1	39	9.2788	0.0041
1966-67	41	19.4554	0.8493	1	39	7.2872	0.0102
1967-68	41	19.6740	0.6946	1	39	4.6944	0.0364
1968-69	41	19.7585	0.5885	1	39	3.8806	0.0560
1964-68	205	20.3671	0.7116	1	203	23.7141	0.0000

[a]The curve is of the form $y=C_1 + C_2 \log_e x$ when y=pupil-teacher ratio (variable 17) and x=size of school system (variable 4).

Graphs of the Relationship between Administrative Ratios and Time

Figures 3, 4, 5, and 6 illustrate the relationship between the percentage of staff in administrative positions (variable 10) and time (1964-65 to 1968-69 inclusive) for each of the forty-one school systems in the sample.

Summary of Chapter IV

The results of the testing of hypotheses one, two, and three appeared to indicate, for certain urban school systems in western Canada, the percentage of staff in administrative positions in a school system was significantly negatively correlated with the total number of pupils in a school system, the total professional and administrative staff in a school system, and the total number of schools in a school system.

The testing of hypotheses four to eleven yielded the following results. First, smaller school systems had significantly higher mean percentages of staff in total administrative positions, and in central office administrative positions than did the larger school systems. Second, smaller school systems in the sample had significantly higher mean administrative staff per 1,000 pupils, and significantly higher mean administrative staff per 100 teachers, than did the larger school systems. Third, there were no significant differences between groups of smaller and larger school systems in the sample in either the mean total administrative staff per school, or in the mean central office administrative staff per school. Fourth, smaller school systems in the sample had significantly lower mean percentages of staff in central

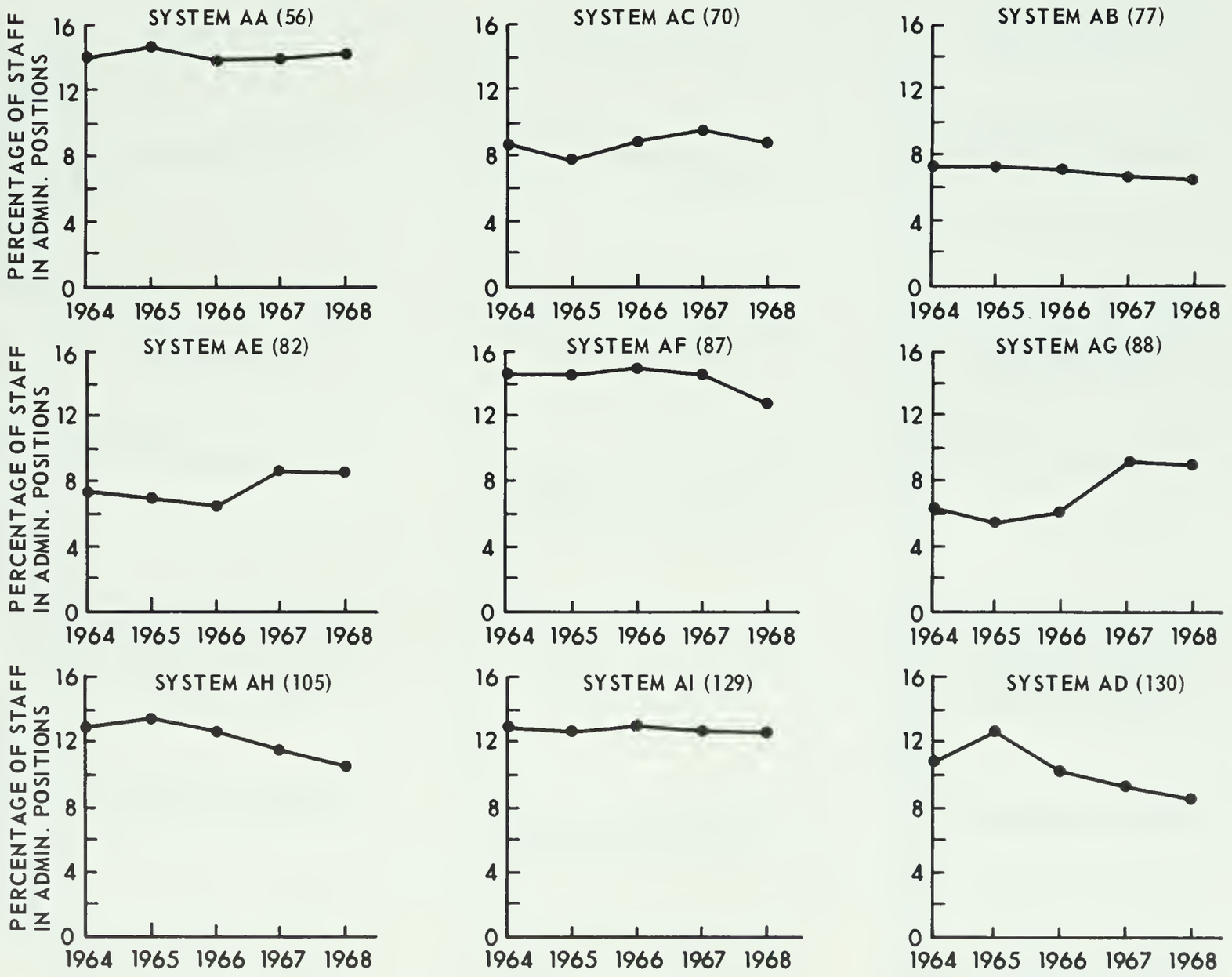

FIGURE 3: PERCENTAGES OF STAFF, PER YEAR, IN ADMINISTRATIVE POSITIONS IN ALBERTA SCHOOL SYSTEMS

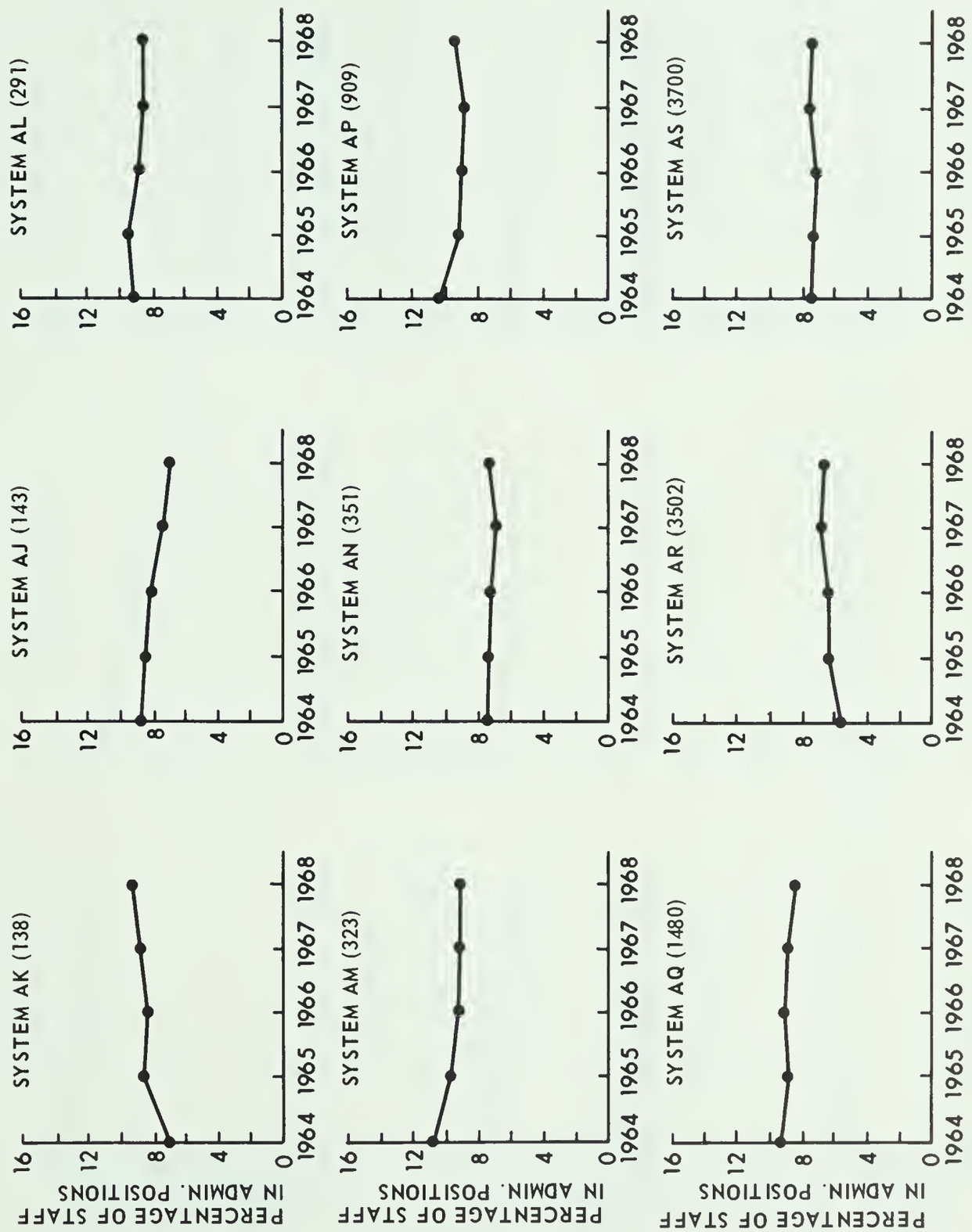

FIGURE 3 (continued)

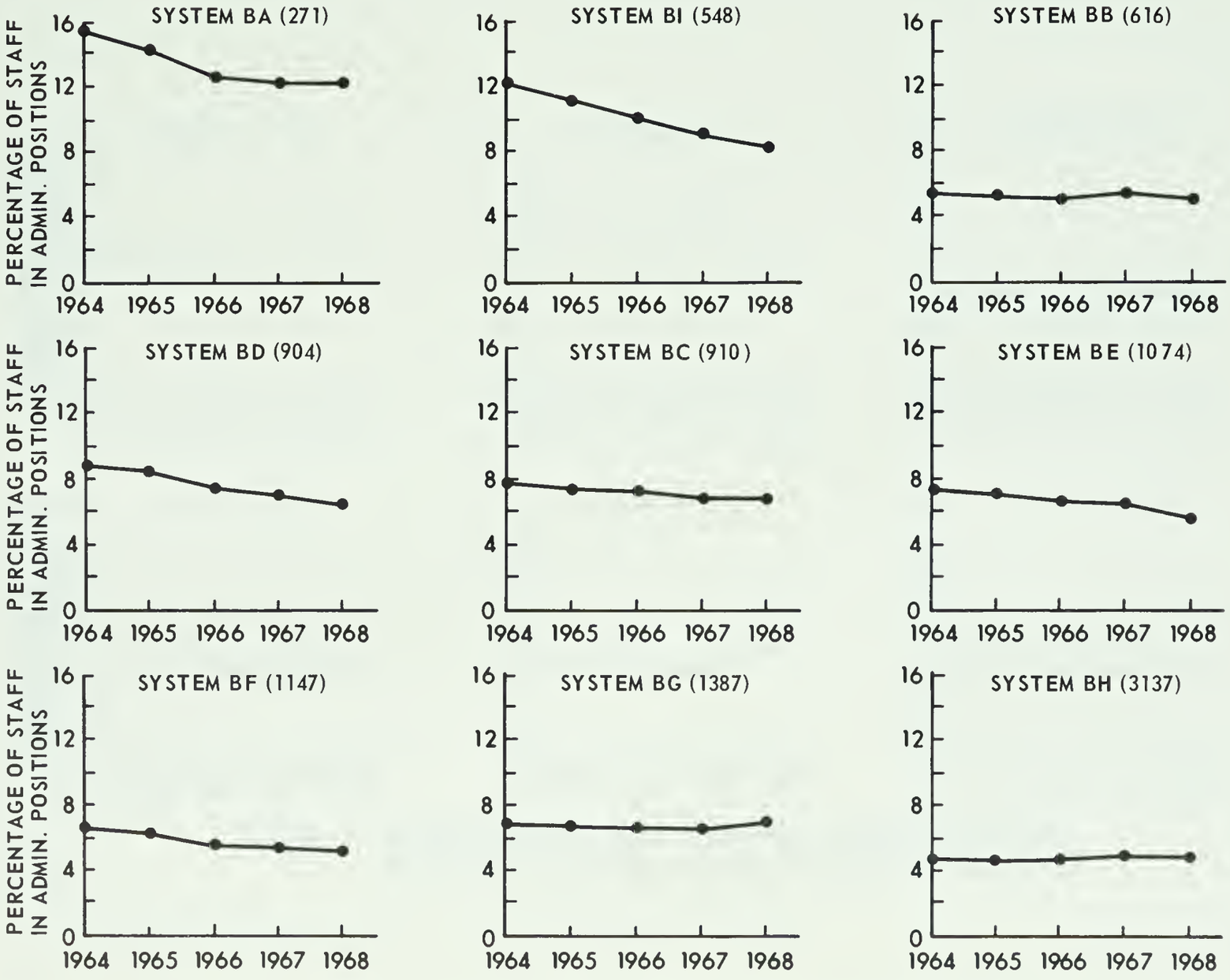

FIGURE 4: PERCENTAGES OF STAFF, PER YEAR, IN ADMINISTRATIVE POSITIONS IN BRITISH COLUMBIA SCHOOL SYSTEMS IN THE SAMPLE

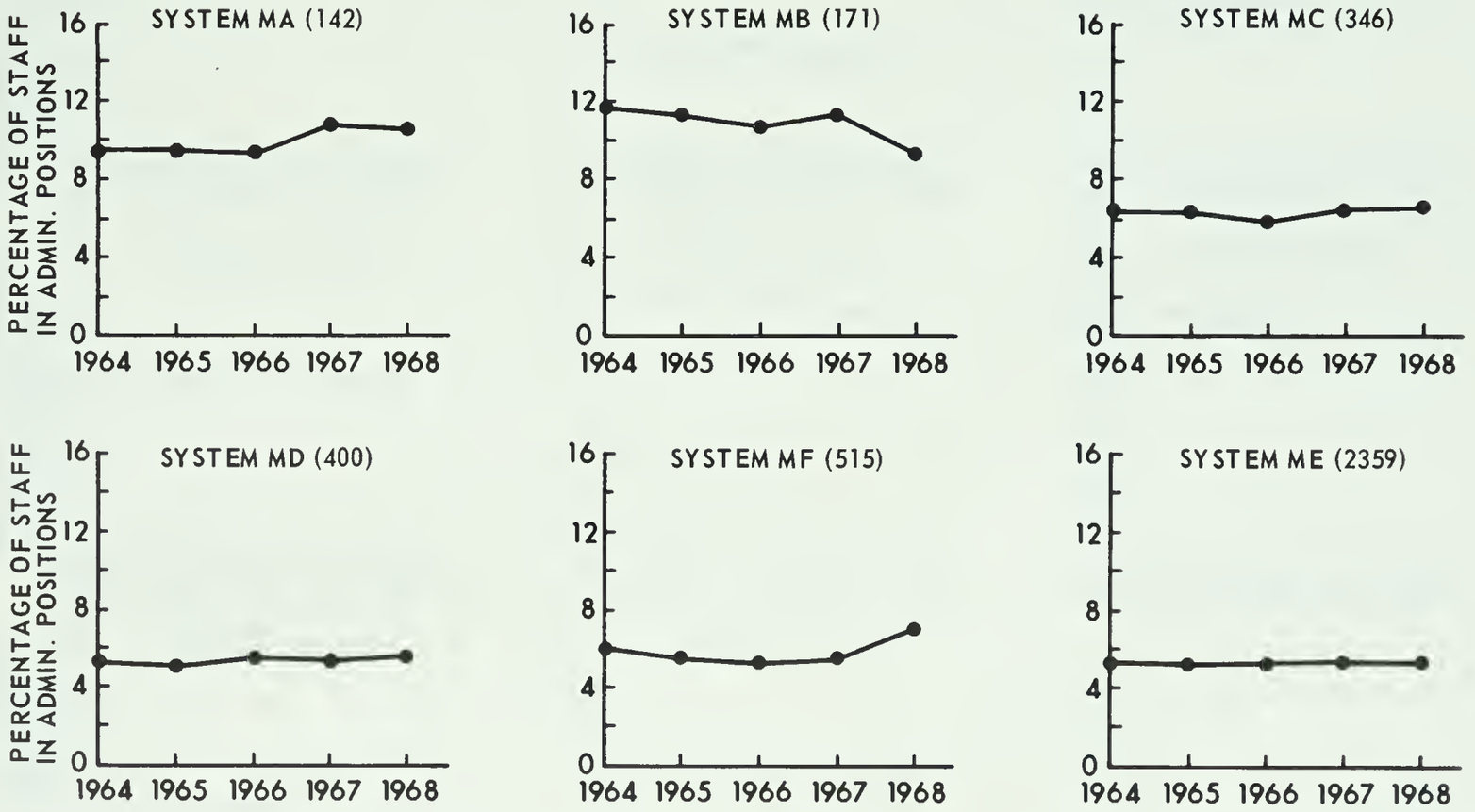

FIGURE 5: PECENTAGES OF STAFF, PER YEAR, IN ADMINISTRATIVE POSITIONS IN MANITOBA SCHOOL SYSTEMS IN THE SAMPLE

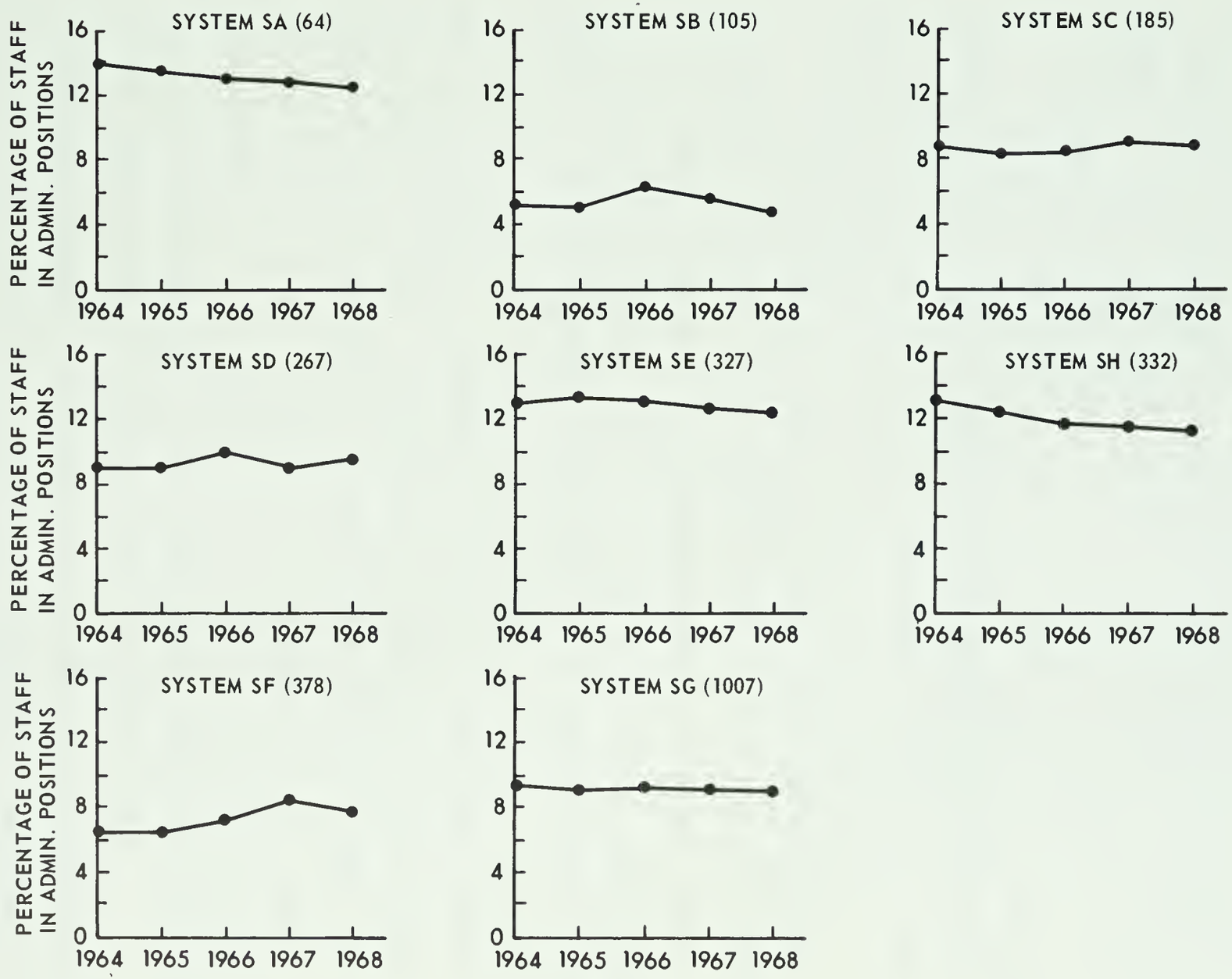

FIGURE 6: PERCENTAGES OF STAFF, PER YEAR, IN ADMINISTRATIVE POSITIONS IN SASKATCHEWAN SCHOOL SYSTEMS IN THE SAMPLE

office professional positions than did the larger school systems. Fifth, in the forty-one school systems in this study the mean pupil-teacher ratio increased from groups of smaller size school systems to groups of medium size school systems, and then decreased in the groups of the largest school systems.

Multiple regression analysis was used to examine the relationship between the size of school system in terms of the total professional and administrative staff and each of the eight variables, from ten to seventeen inclusive.

The relationships between the size of school system and the percentage of staff in total administrative positions, between the size of the school system and the percentage of staff in central office administrative positions, between the size of the school system and the number of administrators per 1,000 pupils, and between the size of the school system and the number of administrative staff per 100 teachers, were all logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and negative in slope. The relationships between the size of school system and the total number of administrative staff per school, and between the size of school system and the number of central office administrative staff per school, did not fit the predicted model and were not of the form $x=e^{a-by}$. The relationships between the size of the school system and the percentage of staff in central office professional positions, and between the size of the school system and the pupil-teacher ratio, were curvilinear, asymptotic, logarithmic, of the form $x=e^{a-by}$, and positive in slope.

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CHAPTER V

THE RELATIONSHIP BETWEEN THE OCCURRENCE OF ADMINISTRATIVE STAFF OFFICES AND THE SIZE OF SCHOOL SYSTEMS

The purpose of the data analysis in this chapter was to test hypothesis twelve: "Each administrative staff office begins to occur consistently at a specific size of school system."

In order to test hypothesis twelve, the forty-one school systems in the sample were ranked in order of size, from smallest to largest, and a frequency count was made of the occurrence of each administrative office. (Table III)

Any administrative office which appeared in the data in the years 1964-65 to 1967-68 which had ceased to exist in the 1968-69 data year was omitted from the analysis. Wherever the functions or the title of an office had changed during the five-year period of the study the 1968-69 designation of the office was used. To clarify the terminology used in this chapter, three definitions are repeated below.

School system size. Throughout this chapter, school system size refers to the total number of professional and administrative staff employed in schools throughout the system and at central office. (Variable (4), Table III)

A problem was encountered in the identification of school systems by the fact that this study contains five years of data, from 1964-65 to 1968-69 inclusive, for each of the forty-one school systems. In effect, this means that each system has five sizes, one for each of the

five years.

To overcome this problem, in this chapter the convention was adopted of identifying each of the school systems by its 1968-69 school year size. For example, the Alberta system which was referred to as AA on Table III, and which had a 1968-69 size of 56, was referred to in this chapter as system 56. This convention enabled school systems to be identified, and their 1968-69 sizes to be indicated, simultaneously.

At the same time, the size of school system at which a specific administrative office occurred was given as the actual size of system at which that particular office first appeared in that system. For example, in system AA on Table III, which had a 1968-69 size of 56, the office of superintendent first appeared in 1964-65 at size 50. This would be reported as follows: in system 56 the office of superintendent first appeared at size 50.

Consistent occurrence of an administrative office. An office was arbitrarily said to occur consistently, if, above a certain size of system, it appeared in at least fifty per cent of systems.

Threshold size (T. S.). Threshold size was the size of school system at which a particular administrative office began to occur consistently.

Division of the Sample into Groups of Large and Small Systems

In order to simplify the data analysis in this chapter, the main sample was divided into one group of large school systems and one

group of small school systems. Each of the two groups of school systems was examined separately.

The first group examined consisted of the twenty-nine school systems which were less than size 904. The second group consisted of the twelve remaining school systems, which were greater than or equal to size 904. Following examination of the two groups of school systems, the findings were summarized and synthesized for the entire sample of forty-one school systems.

The division between the two sets of systems was made at system 904 because a natural break in the data occurred at this point. That is, the data did not contain any systems between 1968-69 sizes 616 and 904. Inspection of the data appeared to indicate that the larger systems included a number of offices which did not occur in the smaller systems.

Categorization of Administrative Offices

Examination of the data indicated that the name for a particular administrative office differed among school systems in the same province, and among school systems in the four western provinces. Therefore, in order to compare the positions categorized as administrative staff in the forty-one school systems in the sample, it was necessary to recognize the functions for which a varied nomenclature was used and to impose a single title for each. To do this, the central office administrative positions were listed in groups by similarity of function, and given a title by which they were subsequently recognized and counted. This is shown in Table XXXVI.

TABLE XXXVI

CATEGORIZATION OF THE ADMINISTRATIVE OFFICES REPORTED BY THE TWENTY-NINE SMALLER SCHOOL SYSTEMS IN THE SAMPLE FOR THE YEARS 1964-65 TO 1968-69 INCLUSIVE[a]

Offices reported by school systems	Category
Superintendent of Schools District Superintendent Director	Superintendent
Assistant Superintendent Deputy Assistant Superintendent Deputy Superintendent	Assistant Superintendent
Superintendent of Elementary Education Director of Instruction--Elementary Assistant Superintendent--Elementary Coordinator of Elementary Education	Director of Elementary Education
Superintendent of Secondary Education Director of Instruction--Secondary Assistant Superintendent--Secondary Coordinator of Secondary Education	Director of Secondary Education
Coordinator of Guidance and Special Services Coordinator of Special Services Department Head--Pupil Personnel Services	Director of Guidance
Administrative Assistant	Administrative Assistant
Director of Adult Education	Director of Adult Education
Supervisor of Instructional Aids Coordinator of Learning Resources	Audio-Visual Supervisor
Coordinator ETV	Coordinator ETV
Librarian (System Wide) District Librarian Department Head--Library Library Officer	Library Officer

[a]The actual names for offices were reported in the discussion of the twelve larger school systems so they were not included here.

TABLE XXXVI (continued)

Offices reported by school systems	Category
Supervisor of: Home Economics Physical Education, Music, Art Reading, French Language, Industrial Arts, Religious Instruction, Elementary Instruction, Secondary Instruction, Primary Instruction, Intermediate Instruction	Subject Supervisor (1) to (8)
Consultant in: Oral French, Reading, Art, Band, Physical Education Curriculum Assistant Subject Consultant	Subject Consultant (1) to (9)
Secretary-Treasurer Business Administrator	Secretary-Treasurer
Assistant Secretary-Treasurer Deputy Assistant Secretary-Treasurer	Assistant Secretary-Treasurer
Accountant Comptroller	Accountant
Purchasing Agent	Purchasing Agent
Buildings and Maintenance Supervisor Maintenance Supervisor Buildings Supervisor Plant Manager	Buildings and Maintenance Officer
Assistant Maintenance Supervisor	Assistant Buildings and Maintenance Officer
Attendance Officer Truant Officer	Attendance Officer

I. THE SMALLER SYSTEMS

The frequency with which the administrative offices occurred during the five school years 1964-65 to 1968-69 inclusive, in the twenty-nine smaller school systems in the sample, is shown in Table XXXVII. The thirty-seven administrative positions which were reported by the smaller school systems are set out in this table in descending order of frequency of occurrence. The actual size of school system at which a particular administrative office first appeared in the smaller school systems in the sample in the period under study is also indicated in Table XXXVII.

Initial Diversification of Administrative Positions

The offices of superintendent and secretary-treasurer occurred in all school systems. After these two positions, the first administrative offices to appear were those of subject supervisor, subject consultant, attendance officer, building and maintenance officer, library officer, and assistant secretary-treasurer. None of these six additional offices occurred more than twice in the seven smallest school systems. Their appearance was not closely related to the order established by the frequency count, nor to a subsequent regularity of appearance.

The Occurrence of the Major Offices

Director of elementary education (T.S. 80). The first office for which a threshold size was established was the position of director of elementary education. In order to establish the threshold

TABLE XXXVII

THE OCCURRENCE OF ADMINISTRATIVE OFFICES IN THE TWENTY-NINE SMALLER SYSTEMS IN THE SAMPLE FOR THE FIVE SCHOOL YEARS 1964-65 TO 1968-69 INCLUSIVE.[a]

NAME OF OFFICE	1968-69 SIZE OF SCHOOL SYSTEM																													FREQUENCY
	56	64	70	77	82	87	88	105[a]	105[b]	129	130	138	142	143	171	185	267	271	291	323	327	332	346	351	378	400	515	548	616	
Superintendent	50	50	58	65	66	56	64	85	76	131	65	124	133	113	92	137	218	221	246	231	242	205	290	308	316	245	366	339	444	29
Secretary Treasurer	50	50	58	65	66	56	64	85	76	131	65	127	133	113	92	137	218	221	246	231	242	205	290	308	344	245	366	339	444	29
Bldg. & Maint. Off.					66		82				65			113	140	185	218	221	246	231	242	205	290	308	363	245	366	339	444	19
Asst. Superintendent 1									80	131		127	133	135		173	231		246	312	242	205	334	308	344		515			15
Supervisor 1		59			66						87		133		92	157		221			242		290	308	316	371	366	548	444	15
Supervisor 2											87		133		92			263			242		305	308	316	371	515		524	11
Consultant 1		50						85							140		218		246	231	242	205		346			515			10
Asst. Sec. Treasurer						84				131		136					218	220	291								515		567	8
Library Officer						56										157	267			231	242			351	363					7
Dir. of Elementary Ed.																		221		231					344	308	488	339	444	7
Dir. of Guidance											87							245	246		267				344		515	548		7
Attendance Officer			58		80				85							185				231						245	488			7
Dir. of Secondary Ed.																				271					344	308	515	447	444	6
Consultant 2																	218		246	231	242	205					515			6
Supervisor 3															92								316	308	316		515			5
Consultant 3																	240		246	231	242	205								5
Consultant 4																	267		279	312	267	205								5
Purchasing Agent									94														334		378			398	444	5
Accountant																		221			242	279						339		4
Supervisor 4																								351	316		488			3
Consultant 5																			291		267	244								3
Consultant 6																					295	244								2
Consultant 7																					295	244								2
Consultant 8																					295	244								2
Consultant 9																					316	332								2
Admin. Asst. 1																				231		332								2
Dir. of Adult Ed.																		271							363					2
Asst. Superintendent 2																								308	344					2
Asst. Maint. Off.																											515		496	2
A/V Supervisor																											515		548	2
Dir. Research & Plan.																	240													1
Admin. Asst. 2																						332								1
Supervisor 5																											366			1
Supervisor 6																											366			1
Supervisor 7																											515			1
Supervisor 8																											515			1
Coordinator of ETV																												398		1

[a]The table gives the actual size of school system at which a particular administrative office first appeared in the school systems in the sample. For example, the office of Assistant Superintendent 1 first appeared in system 105b at size 80.

size for this office the positions of assistant superintendent and director of elementary education both had to be examined. These two offices were discussed together as their occurrence appeared to be related.

Table XXXVIII illustrates that the occurrence of the offices of assistant superintendent and director of elementary education appeared to be mutually exclusive between systems 105 and 616 inclusive, with the exception of systems 323, 378, and 515. That is, sixteen school systems which had an assistant superintendent did not have a director of elementary education, or vice versa.

Information supplied by the school systems suggested the relationship between the two offices. For example, systems 400 and 515 reported an assistant superintendent--elementary. Because this relationship between these two offices was noted the position of director of elementary education was said to have begun to occur consistently in system 105 at size 80.

The position of assistant superintendent which was not connected with a department of elementary education occurred in three systems, in system 246 at size 231, in system 344 at size 344, and in system 515 at size 488. Thus the office of assistant superintendent occurred too infrequently for a threshold size to be established.

The establishment of the offices of director of elementary education and first assistant superintendent represented the first major divisions in the hierarchical structure below the office of superintendent, and indicated the first establishment of an office concerned with a specific part of the instructional program. With

TABLE XXXVIII

COMPARISON OF THE OCCURRENCES OF THE OFFICES OF ASSISTANT SUPERINTENDENT AND DIRECTOR OF ELEMENTARY EDUCATION IN THE GROUP OF SMALLER SCHOOL SYSTEMS[a]

System	Size of system at which office of assistant superintendent first appeared	Size of system at which office of director of elementary education first appeared
105	80	--
129	131	--
130	--	--*
138	127	--
142	133	--
143	135	--
171	--	--
185	173	--
267	231	--
271	--	221
291	246	--
323	312	231
327	242	--
332	205	--
346	334	--
351	308	--
378	344	344
400	--	308
515	515	488
548	--	339
616	--	444

[a]This table covers the appearance of these offices for the time period 1964-65 to 1968-69 inclusive.

*This school system reported an elementary supervisor.

three exceptions these two aspects appeared to be combined in one office which was concerned with the direction of elementary education.

First supervisor (T.S. 87), second supervisor (T.S. 87), and third supervisor (T.S. 308). The frequency of occurrence of the various subject supervisors is shown in Table XXXVII on page 114. The threshold size for the first and second subject supervisors was established as 87. Regular appointment of the first and second supervisors began in system 130 at size 87, and then occurred in thirteen out of nineteen systems for the first supervisor, and eleven out of nineteen systems for the second supervisor. The office of third subject supervisor, which occurred four times in seven school systems, began to appear consistently in system 346 at size 308.

Fourteen school systems reported that they did not have any supervisors of an area of instruction. However, five of the school systems which did not have supervisors did have subject consultants. The number of supervisors in each of the twenty-nine smaller school systems in the sample for the 1968-69 school year is shown in Table XXXIX. The largest number of subject supervisors was reported by system 515, which had eight of them.

First subject consultant (T.S. 140). The position of subject consultant first appeared in system 64 at size 50, but it did not begin to occur consistently until system 171 at size 140. This office then occurred consistently in eight of fifteen school systems. (Table XXXVII)

TABLE XXXIX

NUMBER OF SUBJECT SUPERVISORS AND SUBJECT CONSULTANTS IN EACH OF THE TWENTY-NINE SMALLER SCHOOL SYSTEMS IN THE SAMPLE DURING THE 1968-69 SCHOOL YEAR

School system	Number of supervisors	Number of consultants	School system	Number of supervisors	Number of consultants
56	0	0	185	1	0
64	1	1	267	0	4
70	0	0	271	2	0
77	0	0	291	0	4
82	1	0	323	0	3
87	0	0	327	2	9
88	0	0	332	0	9
105a	0	1	346	3	0
105b	0	0	351	4	1
129	0	0	378	4	0
130	2	0	400	2	0
138	0	0	515	8	2
142	2	0	548	1	0
143	0	0	616	2	0
171	3	1			

Nineteen of the school systems in this portion of the sample did not report any subject consultants. The number of consultants in each of the twenty-nine smaller school systems for the 1968-69 school year is indicated in Table XXXIX. Systems 327 and 332 both reported nine subject consultants. The offices of second to ninth subject consultant either did not occur often enough or regularly enough for threshold sizes to be established for them.

Building and maintenance officer (T.S. 113). The position of building and maintenance officer first appeared in system 82 at size 66, but it did not begin to occur consistently until system 143 at size 113.

The position of assistant building and maintenance officer occurred twice, in system 515 at size 515, and in system 616 at size 496. (Table XXXVII, page 114)

Director of guidance (T.S. 245). The office of director of guidance began to occur consistently in system 271 at size 245. (Table XXXVII, page 114) This position was identified in six of the twelve largest school systems in this portion of the sample.

The raw data supplied by the school systems indicated that the functions of guidance, special education, and pupil personnel services, were all coordinated under the director of guidance in the smaller school systems of the sample. For example, this office was reported in system 291 as the coordinator of guidance and special services, in system 271 as the coordinator of special services, and in system 378 as the department head of pupil personnel services. In the six systems reviewed here, there was never more than one administrative

office reported for the three functions of guidance, special education, and pupil personnel services.

In three of the six cases referred to above, the director of guidance was concerned with the supervision of specialist professional personnel who were attached to central office. For example, system 515 reported three psychologists and five social workers, and system 291 reported one speech therapist, one pupil-services consultant, and one reading clinician. The other three systems gave insufficient evidence about the employment of personnel in these fields to enable the status of the office to be perceived.

Director of secondary education (T.S. 271). The office of director of secondary education first occurred in system 323 at size 271. This position occurred in six of the largest ten school systems in this portion of the sample. (Table XXXVII, page 114) The threshold size for this office was therefore taken to be 271.

The earlier discussion of the relationship between the director of elementary education and the first assistant superintendent led to a consideration of the relationship between the second assistant superintendent and the control of secondary education.

Two second assistant superintendents were reported in Table XXXVII, one in system 378, which also had a director of secondary education, and one in system 351 which did not have a director of secondary education. Since the office of second assistant superintendent occurred only twice in the twenty-nine smaller school systems in the sample no conclusions were drawn about the nature of the office.

In summary, the office of director of secondary education, which exercised control over secondary education in systems in this sample, began to occur consistently at size 271.

Business operations--purchasing agent (T.S. 334). The office of purchasing agent, which had a threshold size of 334, was the first position after the office of secretary-treasurer to be added to the business management operations of the school systems in the sample.

The office of purchasing agent first appeared in system 105a at size 94, but it did not begin to occur consistently until system 346 at size 334. This office occurred four times in the largest seven systems in this section of the total sample. (Table XXXVII, page 114)

The position of assistant secretary-treasurer appeared eight times in the twenty-nine smaller systems of the sample. Although this position first occurred in system 87 at size 84, no threshold size could be established for it as it appeared too irregularly.

The office of accountant occurred later and less frequently than the office of assistant secretary-treasurer among the ranked systems of the sample. (Table XXXVII, page 114) Since the position of accountant appeared first in system 271 at size 221 and occurred only three times thereafter no threshold size could be established for this office.

Diversification of the control of business operations, then, appeared to be established at size 334 with the office of purchasing agent. While the offices of assistant secretary-treasurer and accountant began to appear, neither office occurred consistently

enough for a threshold size to be established.

Other offices. The offices which appeared in this portion of the sample, and which have not so far been discussed because they did not occur often enough or consistenly enough for threshold sizes to be established for them are listed below, with their frequencies:

Library Officer---------- 7

Attendance Officer---------- 7

First Administrative Assistant---------- 2

Second Administrative Assistant---------- 1

Director of Adult Education---------- 2

Audio-Visual Supervisor---------- 2

Coordinator of ETV---------- 1

Research and Planning Officer---------- 1

Although the positions of library officer and attendance officer appeared quite frequently, no threshold sizes could be established for them as they occurred too inconsistently.

The office of director of adult education occurred in two widely separated systems, system 271 at size 271, and in system 378 at size 363.

Audio-visual supervisors appeared in system 515 at size 515, and in system 548 at size 548, which indicates that both were added as new positions in 1968-69. The office of coordinator of ETV also occurred in system 548, but at size 398. The increases in administrative staff represented by these two positions are probably a result of the introduction into school systems of new technologies such as educational

television.

The position of administrative assistant occurred once in system 323 at size 231, and twice in system 332, both at size 332, and in all three cases appeared to be attached to senior administrative offices. In system 332, one administrative assistant worked in the office of the assistant superintendent of elementary education. The second administrative assistant worked in the area of business operations and was probably assigned to the secretary-treasurer as no assistant secretary-treasurer was reported for this system. As Gill suggests (1967:70-71), the appointment of an administrative assistant might be a device to increase the operational capacity of the senior levels of the system, without further diversifying the structure by the creation of an additional hierarchical position.

II. THE LARGER SYSTEMS

In this section of the sample there were twelve school systems. In order of 1968-69 size these were:

system 904	system 1387
system 909	system 1480
system 910	system 2359
system 1007	system 3137
system 1074	system 3502
system 1147	system 3700

The administrative offices which occurred in each of these twelve school systems are discussed below under headings which refer to major functional areas of school systems.

The Senior Administrative Level

The position of superintendent as that of the chief executive officer, appeared in all twelve of the larger school systems. Below this office divisions of responsibilities occurred in a more marked fashion than had been the case in the smaller systems. In the twelve larger systems a distinct departmentalization was observable. However, some variation was shown in the pattern of structural development in these systems.

The first hierarchical change was the creation of the new office of associate superintendent between that of the superintendent and the officers in charge of such major departments as those of elementary and secondary education. The office of associate superintendent, which occurred in eight of the twelve largest systems, first appeared in system 910 at size 653. This office occurred in systems 909, 910, 1007, 1074, 1147, 1387, 1480, and 3502. The office of associate superintendent did not occur in systems 904, 2359, 3137, and 3700.

All of the systems which reported the office of associate superintendent also had assistant superintendents and/or directors of the departments of elementary and secondary education.

The office of associate superintendent appeared to have two main functions. First, this officer was responsible for the superintendent's duties whenever the superintendent was away from the school system. Second, the associate superintendent was the director of instruction and was responsible for the coordination of the various departments which made up the total instructional program offered by the system.

System 3502 reported two associate superintendents, one in charge of instruction and the other in charge of business. There were assistant superintendents in charge of departments below both of the associate superintendents in system 3502.

Systems 3502 and 3700 both had one administrative assistant to the divisional superintendent. Systems 3502 and 909 both had one administrative assistant to the associate superintendent.

The office of associate superintendent occurred between the position of superintendent and the officers in charge of such departments as those of elementary and secondary education in eight of the twelve larger school systems. The threshold size for this office was established at 653.

Departments of Elementary and Secondary Education

In the discussion of the smaller systems of the sample the occurrence of the separate direction of elementary and secondary education was noted, and threshold sizes were established for the offices of director of elementary education and director of secondary education.

In the twelve largest systems the most notable feature of the departments of elementary and secondary education was the establishment of additional offices concerned with their administration. Systems 904, 909, 910, 1074, and 1147 each had one director of elementary instruction and one director of secondary instruction. System 1007 reported one assistant superintendent of elementary schools and one assistant superintendent of secondary schools, but did not report the

office of director below either of these positions. However, system 1007 did report the first additional office in the department of secondary education. This was the office of assistant superintendent of secondary curriculum which first occurred in system 1007 at size 781.

In the department of elementary education, system 1387 reported a director of elementary instruction and three administrative assistants. Two of the administrative assistants were added to system 1387 at size 1040 and one was added at size 1271. In the department of secondary education, system 1387 reported a director of secondary instruction, and two administrative assistants, one of whom was added at size 1040 and one at size 1271.

The administrative structure of the departments of elementary and secondary education in the five largest school systems in the sample are shown below. The size of school system at which each additional office was added to a particular school system is shown in brackets after the name of the office. Examination of these five school systems showed that additional line offices were added to the departments of elementary and secondary education as the school systems increased in size.

Elementary Education	Secondary Education
System 1480	System 1480
Assistant Superintendent--Elementary (916)	Assistant Superintendent--Secondary (1335)
Director of Elementary Instruction (916)	Director of Secondary Instruction (916)
Assistant Director of Elementary Instruction (1480)	Assistant Director of Secondary Instruction (1480)

Elementary Education	Secondary Education
System 1480	System 1480
	Director of Vocational Education (916)
	Director of Religious Education (1480)
System 2359	System 2359
Superintendent of Elementary Schools (2359)	Superintendent of Secondary Schools (2359)
Assistant Superintendent of Elementary Schools (2041)	Assistant Superintendent of Secondary Schools (2041)
Deputy Assistant Superintendent of Elementary Schools (2041)	Deputy Assistant Superintendent of Secondary Schools (2041)
	Assistant Superintendent of Vocational Education (2359)
System 3137	System 3137
Assistant Superintendent of Elementary Schools (2730)	Assistant Superintendent of Secondary Schools (2730)
Director of Instruction-- Elementary (2730)	Director of Instruction-- Secondary (2730)
Director of Instruction-- Elementary (2730)	Director of Instruction-- Secondary (2730)
Inspector of Schools (2730)	Inspector of Schools (2730)
System 3502	System 3502
Assistant Superintendent of Elementary Education (2654)	Assistant Superintendent of Secondary Education (2654)
Director, Division I (3284)	Director, Senior High Schools (2654)
Director, Division II (2654	Director, Secondary Curriculum (2831
Director, Elementary Curriculum (3502)	Director, Junior High School Administration (2654)

Elementary Education	Secondary Education
System 3502	System 3502
	Director, Junior High School Instruction (2654)
	Director, Vocational Education (2654)
System 3700	System 3700
Superintendent of Elementary Schools (2341)	Superintendent of Secondary Schools (2341)
Assistant Superintendent of Elementary Schools--North Zone (2341)	Assistant Superintendent of Secondary Schools (2341)
Assistant Superintendent of Elementary Schools--West Zone (2341)	Assistant Superintendent of Secondary Schools (2341)
Assistant Superintendent of Elementary Schools--South Zone (3700)	Administrative Assistant to Superintendent of Secondary Schools (3339)
Administrative Assistant to Superintendent of Elementary Schools (3339)	

Diversification of structure in the departments of elementary and secondary education began to occur consistently in system 1387 at size 1040.

Beginning with system 1387, the six largest school systems in the sample had three or more administrative offices in both the departments of elementary and secondary education. Threshold sizes for offices in the department of elementary education were established as follows: 1040 for the second office, 1040 for the third office, and 2730 for the fourth office. In the department of secondary education the following threshold sizes were established: 1040 for the second

office, 1271 for the third office, and 1480 for the fourth office.

Elementary education in one large urban centre, system 3700, which had a superintendent of elementary schools, was divided into three zones with an assistant superintendent in charge of each zone.

Subject Supervisors and Subject Consultants

In the examination of the set of smaller school systems, the threshold sizes for the first subject consultant and for the first three subject supervisors were established.

Table XL shows the number of subject supervisors and subject consultants in each of the twelve largest school systems in the sample, for each of the years 1964-65 to 1968-69 inclusive. An examination of this table indicated that, in general, the number of supervisors increased as the size of the school system increased, and that the office of consultant occurred inconsistently in a fashion only partially related to the size of school system.

As is shown when Table XL is compared with Table III (pages 42-50), the pattern of six or more supervisors in a school system begins to occur consistently in system 909 at size 621. A marked increase in the number of supervisors was noted in the four largest systems, beginning with system 2359. Three of the four largest school systems had twenty-five or more subject supervisors.

A comparison of Table III (pages 42-50) with Table XL led to the establishment of the following threshold sizes for supervisors and consultants: supervisors four, five, and six, 621; supervisors seven and eight, 1021; supervisors nine and ten, 1181; supervisors eleven

TABLE XL

NUMBERS OF SUBJECT SUPERVISORS AND SUBJECT CONSULTANTS IN THE TWELVE LARGEST SCHOOL SYSTEMS IN THE SAMPLE FOR THE SCHOOL YEARS 1964-65 TO 1968-69 INCLUSIVE[a]

	1964-65		1965-66		1966-67		1967-68		1968-69	
System	No. of superv.	No. of consult.	No. of superv.	No. of consult.	No. of superv.	No. of consult.	No. of superv.	No. of consult.	No. of superv.	No. of consult.
904	2	1	2	1	2	1	3	1	4	1
909	5	1	7	2	9	3	9	6	11	9
910	3	0	3	0	3	0	4	0	4	2
1007	3	16	3	16	3	16	3	16	3	16
1074	6	1	6	1	6	1	6	1	6	1
1147	4	2	4	2	4	2	4	2	4	2
1387	6	3	7	2	7	2	5	3	8	3
1480	6	3	8	3	10	7	10	11	10	11
2359	21	0	21	0	21	0	23	0	26	0
3137	5	7	5	10	7	8	11	9	13	9
3502	14	0	21	0	24	0	26	0	26	0
3700	14	12	19	15	22	17	28	36	29	46

[a]The size of each school system for each year can be obtained from variable (4) on Table III, pages 42 to 50.

to twenty inclusive, 2041; supervisor twenty-one, 2135; supervisors twenty-two and twenty-three, 2251; supervisors twenty-four and twenty-five, 2359; and consultant two, 910; and consultant three, 1040.

In general, there were few areas of subject supervision found in the larger systems which were not already discernible in the smaller systems in the sample. The principal difference was that the larger systems had more supervisors in a particular area. For example, where a small system had one supervisor of elementary education, a larger system, such as system 3700, had ten.

Table XLI shows the duties of supervisors in the four largest school systems for the 1968-69 school year. The number of supervisors who worked in a particular subject area is listed in brackets after the name of the subject area. A table was not made of the duties of consultants because two of the four largest school systems did not report any, and system 3137 did not supply a breakdown of the duties performed by its nine consultants.

System 3700 reported forty-six consultants. This represented over four times the number of consultants reported by any other school system in this study.

Pupil Personnel Services, Special Education, and Guidance

As was previously mentioned, the functions of guidance, special education, and pupil personnel services were handled by a single officer in the smaller school systems of the sample.

For the twelve largest school systems in the sample, the administrative offices in the areas of guidance, special education,

TABLE XLI

DUTIES OF SUPERVISORS DURING THE YEAR 1968-69 IN THE FOUR LARGEST SCHOOL SYSTEMS IN THE SAMPLE

System 2359	System 3137	System 3502	System 3700
Primary (7)*	Primary (1)	Division I (2)	Division I (4)
	Remedial Reading (1)	Division II (2)	Division II (4)
	Speech (1)	Division III (2)	El. French (1)
	Intermediate Grades (1)	Senior High (1)	El. Reading (1)
Music (3)	Music (1)	Music (3)	Music (5)
Art (3)	Art (1)	Art (2)	Art (2)
Fine Arts (3)		Drama (1)	
Phys. Ed. (4)	Phys. Ed. (1)	Phys. Ed. (4)	Phys. Ed. (4)
Home Ec. (1)	Home Ec. (1)	Home Ec. (1)	Home Ec. (1)
Ind. Arts (1)	Ind. Arts (1)	Ind. Arts (1)	Ind. Arts (1)
		Vocational Ed. (1)	Vocational Ed. (1)
	Commerce (1)	Business Ed. (1)	Business Ed. (1)
Languages (2)		Languages (1)	French (1)
Science (2)	Occupations (1)		Mathematics (1)
			English (1)
	Audio-Visual (1)	Audio-Visual (1)	Audio-Visual (1)**
	Library (1)	Library (2)**	
		Extension Services (1)	

*The figures in brackets indicate the number of supervisors and assistant supervisors who worked in a particular subject area.

**All systems which reported a library supervisor also had a chief library officer, and all systems which reported an audio-visual supervisor also had a director of audio-visual aids.

and pupil personnel services are shown in Table XLII. Threshold sizes for administrative offices in these three areas were established as follows: second office, 653; third office, 916; fourth office, 2041; and fifth office, 3284.

In general, the twelve larger school systems had a department or a set of offices which provided a number of services in the areas of guidance, special education, and pupil personnel services. Eight of the twelve larger systems had from one to four officers of approximately equal rank who were responsible for these three functions. In four of the five largest school systems the functions of pupil personnel services, guidance, and special education were clearly combined in a single department under the charge of an officer of higher rank than had previously been present in the smaller systems.

For the entire sample of forty-one school systems the following general trend appeared. In the smaller school systems the functions of guidance, special education, and pupil personnel services were handled by a single officer. As the school systems increased in size the three functions were handled by a number of administrators of approximately equal rank. In the largest school systems these three functions were coordinated in a new department under the direction of a senior administrative officer. This department could probably be best described as the department of pupil personnel services.

Other Instructional Offices

Director of adult education (T.S. 498). This position first

TABLE XLII

OCCURRENCE OF ADMINISTRATIVE OFFICES IN GUIDANCE, SPECIAL EDUCATION, AND PUPIL PERSONNEL SERVICES IN THE TWELVE LARGEST SCHOOL SYSTEMS IN THE SAMPLE FOR THE YEARS 1964-65 TO 1968-69 INCLUSIVE

System	Office
904	Supervisor of Special Education (498)*
909	Coordinator of Pupil Personnel Services (752) Supervisor of Special Education (909)
910	Supervisor of Special Services (653) Supervisor of Special Education (653)
1007	Supervisor of Guidance (871) Supervisor of Special Education (871)
1074	Supervisor of Special Services (791)
1147	Supervisor of Special Services (939) Supervisor of Special Education (939)
1387	Tests & Measurements Supervisor (1040) Supervisor of Special Education (1040) Coordinator of Special Services (1271)
1480	Director, Pupil Personnel Services (1480) Supervisor of Guidance (916) Supervisor of Special Education (916)
2359	Director, Special Education (2041) Asst. Director Special Education (2041) Asst. Director Special Education (2041) Supervisor of Guidance (2041)
3137	Supervisor of Counselling (2730) Coordinator of Counselling (2970) Supervisor of Special Education (2730) Coordinator of Special Classes (2970)
3502	Asst. Superintendent of Pupil Personnel Services (2654) Director, Counselling Services (2654) Director, Special Education (3072) Director, Bureau of Child Study (3284) Asst. Director, Bureau of Child Study (3284)
3700	Superintendent, Special Education Services (2341) Asst. Superintendent, Special Education Services (2341) Supervisor of Guidance (2694) Asst. Supervisor of Guidance (3700) Supervisor of Special Education (3700) Supervisor, Learning Assistance Centre (3700)

*The number in brackets after the name of the office indicates the size of school system at which that particular office first occurred in that system during the period of this study.

appeared in system 271 at size 271, but it did not begin to occur consistently until system 904 at size 498. The office of director of adult education occurred in seven of the twelve largest school systems in the sample.

The position of assistant director of adult education appeared in systems 1074, 1387, 3137, and 3700, but it appeared too inconsistently for a threshold size to be established.

Audio-visual supervisor (T.S. 515). The office of audio-visual supervisor first appeared in system 515 at size 515 and occurred consistently thereafter. The threshold size for this office was therefore established at 515. In the twelve larger school systems in the sample, this office occurred in nine systems.

Library officer (T.S. 653). The first appearance of the position of library officer was in system 87 at size 56, but it did not begin to occur consistently until system 910 at size 653. This position, which is that of the chief library officer of a school system, occurred in ten of the twelve largest school systems. The threshold size for library officer was established at size 653.

Business Management

The general trend observed in business management was that the number of administrative offices in this department increased as the size of the school system increased. In the group of the twenty-nine smaller school systems the offices of secretary-treasurer and purchasing agent began to occur consistently, and the offices of assistant

secretary-treasurer and accountant began to occur irregularly.

Table XLIII shows the business management offices in the group of the twelve largest school systems in the sample. The size of system at which each office first occurred during the years 1964-65 to 1968-69 is given in brackets after the name of the office. All twelve of the larger systems had a secretary-treasurer, and all of them except system 1007 had at least one purchasing agent.

The third and fourth business management offices began to occur consistently in system 904 at sizes 498 and 765 respectively. As is shown in Table XLIII the third and fourth business offices to appear were usually an accountant and an assistant secretary-treasurer or two accountants.

The fifth business office, which was either an assistant purchasing agent or a second accountant, began to occur consistently in system 2359 at size 2041. A sixth business office, which could be best described as a second assistant secretary-treasurer began to occur consistently in the two largest school systems in the sample at size 2341.

The administrative staff of the business management department gradually increased to the point where six business offices began to occur consistently in the largest school systems in the sample.

Building and Maintenance Department

In the discussion of the twenty-nine smaller systems in the sample, mention was made of the fact that the position of building and maintenance officer began to occur consistently, and that the position of assistant building and maintenance officer began to appear

TABLE XLIII

BUSINESS MANAGEMENT OFFICES IN THE TWELVE LARGEST SCHOOL SYSTEMS IN THE SAMPLE FOR 1964-65 TO 1968-69

System	Office
904	Secretary Treasurer (498)*
	Asst. Sec'y Treasurer (765)
	Accountant (498)
	Purchasing Agent (498)
909	Secretary Treasurer (529)
	First Accountant (529)
	Seccnd Accountant (853)
	Purchasing Agent (529)
910	Secretary Treasurer (653)
	Asst. Sec'y Treasurer (653)
1007	Secretary Treasurer (871)
1074	Secretary Treasurer (791)
	Asst. Sec'y Treasurer (791)
	Accountant (791)
	Purchasing Agent (791)
1147	Secretary Treasurer (939)
	Asst. Sec'y Treasurer (939)
	Purchasing Agent (939)
1387	Secretary Treasurer (1387)
	Asst. Sec'y Treasurer (1387)
	Purchasing Agent (1040)
	Accountant (1040)
1480	Secretary Treasurer (916)
	Asst. Sec'y Treasurer (916)
	Asst. Sec'y Treasurer (916)
	Purchasing Agent (916)
2359	Secretary Treasurer (2041)
	Asst. Sec'y Treas'r. (2041)
	First Accountant (2041)
	Purchasing Agent (2041)
	Second Accountant (2041)
3137	Secretary Treasurer (2730)
	Asst. Sec'y Treasurer(2730)
	Purchasing Agent (2730)
	Asst. Purchas. Agent (3100)
	Accountant (2730)
3502	Secretary Treasurer (2654)
	Deputy Treasurer (2654)
	Deputy Secretary (2654)
	Purchasing Agent (2654)
	Purchasing Agent (2654)
	Buyer (2831)
	Buyer (2831)
	Purchase Planner (2831)
	Requisition Control (2831)
	Director, Accounting & Budget (2831)
	Director, Purchasing & Stores (2831)
	Payroll Supervisor (2654)
3700	Secretary Treasurer (2341)
	Asst. Sec'y Treas'r. (2341)
	Asst. Treasurer (2341)
	Accountant (2341)
	Purchasing Agent (2341)
	Asst. Purchas. Agent (2341)

*Indicates size of system at which office first occurred in that system.

irregularly.

Table XLIV contains a list of all the administrative offices in the department of building and maintenance in the group of the twelve larger school systems. The size of school system at which each office first occurred for the five-year period of this study is shown in brackets after the name of the office. The fact that eight of the twelve largest school systems in the sample reported directors, assistant superintendents, or superintendents in charge of buildings and maintenance operations indicated that a separate department had been created to handle these functions.

A second office in this department began to occur consistently in system 515 at size 515. A third building and maintenance office began to occur consistently in system 1480 at size 916. Fourth and fifth offices in this department began to occur consistently in system 1387 at sizes 1040 and 1104 respectively. With system 2359, a sixth buildings and maintenance office began to occur consistently at size 2041. Seventh, eighth, and ninth offices began to occur consistently in system 3137 at size 2730.

An apparent general trend, then, was that as the size of the school system increased, the administrative staff of the building and maintenance department increased to the point that nine offices in this department began to occur consistently in the three largest school systems in the sample.

TABLE XLIV

BUILDING AND MAINTENANCE OFFICES IN THE TWELVE LARGEST SCHOOL SYSTEMS IN THE SAMPLE FOR 1964-65 TO 1968-69 INCLUSIVE

System	Office
904	Superintendent of Maintenance (498)*
909	Director of Buildings and Maintenance (529) Construction Coordinator (752)
910	Superintendent of Buildings and Grounds (653) Supervisor of Maintenance (653)
1007	Building and Maintenance Supervisor (871) Building and Maintenance Supervisor (871)
1074	Building and Maintenance Supervisor (791) Assistant Building and Maintenance Supervisor (791)
1147	Building Supervisor (939) Correlating Architect (939)
1387	Superintendent of Buildings and Grounds (1040) Asst. Superintendent of Buildings and Grounds (1040) Asst. Superintendent of Buildings and Grounds (1040) Asst. Superintendent of Buildings and Grounds (1040) School Planner (1040)
1480	Supervisor of Maintenance (916) Building Inspector (916) Supervisor of Properties and Maintenance (916)
2359	Director of Maintenance (2041) Assistant Director of Maintenance (2041) Architect (2041) Assistant Architect (2041) Assistant Director of Construction Services (2041) Building Inspector (2041)

*Indicates size of system at which office first occurred in that system during the period of this study.

TABLE XLIV (continued)

System	Office
3137	Director of Construction and Maintenance (2730) Chief Architect (2730) Assistant Architect (2730) Maintenance Superintendent (2730) Assistant Maintenance Superintendent (2730) Assistant Maintenance Superintendent (2730) Supervisor of Building and Maintenance (2730) Operations Superintendent (2730) Assistant Operations Superintendent (2730)
3502	Asst. Superintendent of Facilities and Planning (2831) Director of Planning (2654) Director of Construction (2831) Director of Design (2831) Asst. Director of Maintenance and Operations (3284) Director of Maintenance and Operations (2654) Eleven Facilities and Maintenance Coordinators (3 at 2831, 8 at 3284)
3700	Superintendent of Architecture and Building (2341) Coordinator of Design (2654) Mechanical Engineer (2341) Building Inspector (2341) Building Inspector (2341) Building Inspector (2341) Supervisor of Maintenance (2341) Mechanical Supervisor (2341) Structural Supervisor (2341)

Personnel Department

No personnel officers were reported by the thirty-five smallest school systems in the sample.

Table XLV shows the names of offices in the personnel departments of the six systems which reported them. The numbers in brackets after the name of an office indicates the size of school system at which that office first occurred during the five-year period of this study.

A separate personnel department began to occur consistently in system 1480 at size 916 with the establishment of an office which could best be described as a director of personnel. This was apparent from the fact that four of the five largest school systems reported directors or assistant superintendents of personnel. (Table XLV)

Second and third offices in the personnel department began to occur consistently in system 1480 at size 916. With system 3502, fourth and fifth personnel offices began to occur consistently at size 3284.

As a generalization from the data, a separate personnel department began to occur in the larger school systems at size 916. As the size of the school systems increased, more personnel offices were added, to the point that threshold sizes were established for five personnel offices in the two largest school systems.

Computer Operations Department

No computer operations personnel were reported by the twenty-nine smaller school systems in the sample.

TABLE XLV

OCCURRENCE OF PERSONNEL AND COMPUTER OPERATIONS OFFICES IN THE LARGEST SCHOOL SYSTEMS IN THE SAMPLE FOR THE YEARS 1964-65 TO 1968-69 INCLUSIVE

System	Personnel Department Offices	System	Computer Operations (EDP) Offices
1387	Personnel Officer (1104)*	910	Coordinator of EDP (846)
1480	Director, Teacher Recruitment (916) Director, Maintenance & Clerical Personnel (916) Personnel Officer (916) Personnel Officer (1335)	1480	Coordinator of Data Processing (1480) Admin. Assistant Data Processing (1480)
2359	Personnel Officer (2135)	2359	Data Processing Coordinator (2135) Supervisor of Data Processing (2041) Systems Analyst (2359) Systems Programmer (2359)
3137	Asst. Director of Personnel (3100) Staffing Officer (2730) Labour Relations Officer (2730)	3137	Computer Programmer (3137)
3502	Asst. Superintendent--Personnel (3284) Director of Personnel--Instructional (2831) Director of Personnel--Business (2654) Personnel Officer (3284) Personnel Officer (3284)	3502	Director of Information Systems (3284) Manager of Computer Operations (3284) Programmer/Analyst (3284) Programmer/Analyst (3284) Programmer/Analyst (3284) Programmer/Analyst (3284) Programmer/Analyst (3284)
3700	Director, Personnel Division (2341) Personnel Officer (2341) Personnel Officer (3013) Personnel Officer (3013) Personnel Officer (3700) Asst. Personnel Officer (2694) Asst. Personnel Officer (2694)	3700	Manager of Department of Data Processing (3700) Programmer/Analyst (3700) Programmer/Analyst (3700)

*Indicates size of system at which office first occurred in that system during the period of this study.

Table XLV shows the titles of the computer operations offices for the six systems that reported them. Computer operations offices were not added to the department of business because it was known that computer services are used by several departments in a school system. (Bumbarger and Friesen, 1968:12-33)

A separate department of computer operations or electronic data processing (EDP) first appeared in system 910 at size 846 with the appointment of a coordinator of EDP, but this department did not begin to occur consistently until system 1480 at size 1480.

The second and third computer operations offices began to occur consistently in system 2359 at sizes 2135 and 2359 respectively. The second office was either a supervisor of data processing or a systems programmer/analyst. The third office was usually that of a systems programmer/analyst. All six of the school systems which reported the use of computers had installed their computers in the last three years, that is between 1966-67 and 1968-69.

Six school systems in the sample reported a department of computer operations. The number of administrative personnel in these departments varied, but threshold sizes were established for three computer operations positions.

Other Offices

The offices reported here were either difficult to classify or they occurred too irregularly for threshold sizes to be established for them.

These offices are listed below after the system that reported them. The number in brackets after the name of the position indicates the size of school system at which that office first appeared in that system during the five-year period of this study.

System 909	Research Assistant (909)
	Supervisor of Teacher Orientation (752)
System 1007	Information Officer (Research and Planning) (871)
System 1387	Attendance Officer (1040)
	Director of Dental Services (1387)
System 2359	Director of Research (2041)
System 3137	Director of Research (2730)
	Assistant Director of Research (3100)
	Research Assistant (2730)
	Attendance Officer (2730)
	Program Development Assisistant (3100)
System 3502	Warehouse Manager (2831)
	Assistant Warehouse Manager (2831)
	Equipment Technologist (3284)
System 3700	Elementary Curriculum Committee (five members, 3013)
	Director of Auxiliary Services (2341)
	Planning Officer (Auxiliary Services) (2694)
	Information Officer (2341)
	Two Assistant Information Officers (3013)
	Four Attendance Officers (2341, 3013, 3339, 3339).

III. SUMMARY OF CHAPTER V

The data analysis for the establishment of threshold sizes for the occurrence of administrative offices in forty-one urban school systems in western Canada during the years 1964-65 to 1968-69 inclusive was presented in this chapter. Threshold size was defined as the size at which a particular administrative office began to occur consistently. An administrative office was arbitrarily defined to occur consistently, if, above a certain size of system it appeared in at least fifty per cent of systems. Consistency of occurrence was determined by an inspection of the data after the school systems were ranked in size from smallest to largest, on the basis of the total professional and administrative staff in the system.

It was impossible to establish threshold sizes for some of the offices as they appeared too irregularly in the data. All that could be said in these cases was that they first occurred in a particular system at a certain size and that they occurred inconsistently thereafter.

The threshold sizes that were established for fifty-three administrative offices in the school systems in the sample are summarized in Table XLVI. School system operations were divided into the following parts: senior administrative level, instruction, business, building and maintenance, personnel, and computer operations. The instructional division was subdivided into a number of major task areas. The results of the data analysis in this chapter are summarized below.

TABLE XLVI

THRESHOLD SIZES FOR ADMINISTRATIVE OFFICES IN FORTY-ONE URBAN SCHOOL SYSTEMS IN WESTERN CANADA FOR THE SCHOOL YEARS 1964-65 TO 1968-69 INCLUSIVE

Administrative Office	Threshold Size
SENIOR ADMINISTRATIVE LEVEL	
Superintendent	<50
Associate Superintendent	653
INSTRUCTIONAL	
Elementary Education	
1st office	80
2nd office	1040
3rd office	1040
4th office	2730
Secondary Education	
1st office	271
2nd office	1040
3rd office	1271
4th office	1480
Subject Supervisors	
1st and 2nd offices	87
3rd office	308
4th, 5th, and 6th offices	621
7th and 8th offices	1021
9th and 10th offices	1181
11th to 20th offices	2041
21st office	2135
22nd and 23rd office	2251
24th and 25th offices	2359
Subject Consultants	
1st office	140
2nd office	910
3rd office	1040
Director of Adult Education	498
Audio-Visual Supervisor	515
Chief Library Officer	653

TABLE XLVI (continued)

Administrative Office	Threshold Size
INSTRUCTIONAL	
Pupil Personnel Services	
1st office	245
2nd office	653
3rd office	916
4th office	2041
5th office	3284
BUSINESS DEPARTMENT	
Secretary-Treasurer	<50
Purchasing Agent	334
3rd office	498
4th office	765
5th office	2041
6th office	2341
BUILDING AND MAINTENANCE DEPARTMENT	
1st office	113
2nd office	515
3rd office	916
4th office	1040
5th office	1104
6th office	2041
7th office	2730
8th office	2730
9th office	2730
PERSONNEL DEPARTMENT	
1st office	916
2nd office	916
3rd office	916
4th office	3284
5th office	3284
COMPUTER OPERATIONS DEPARTMENT	
1st office	1480
2nd office	2135
3rd office	2359

Senior Administrative Level

The office of superintendent of schools as the chief executive, and the position of secretary-treasurer occurred in all forty-one school systems in the sample. The threshold size for the position of associate superintendent was 653.

Elementary and Secondary Education

The first line office to appear after that of the superintendent was one that exerted control over elementary education. This office represented the first differentiation of line function within the administration of a school system, and the first sign of departmentalization. The threshold size for this office, which was categorized as the director of elementary education, was 80. Threshold sizes for the second, third, and fourth administrative offices in the department of elementary education were established at sizes 1040, 1040, and 2730 respectively.

The establishment of a controlling office for secondary education first took place in larger school systems than did the first controlling office for elementary. The threshold size for such an office appeared to be 271. Second, third, and fourth administrative offices were added to the department of secondary education at threshold sizes 1040, 1271, and 1480 respectively.

In the general area of instruction threshold sizes were established for three additional offices. These were a director of adult education at size 498, an audio-visual supervisor at size 515, and a chief library officer at size 653.

Subject Supervisors and Subject Consultants

The first administrative staff office to occur, as distinct from the first administrative line office, was the position of supervisor of an area of instruction. An examination of the data led to the establishment of the following threshold sizes for subject supervisors: first and second supervisors, 87; third supervisor, 308; fourth, fifth and sixth supervisors, 621; seventh and eighth supervisors, 1021; ninth and tenth supervisors, 1181; eleventh to twentieth supervisors, 2041; twenty-first supervisor, 2135; twenty-second and twenty-third supervisors, 2251; and twenty-fourth and twenty-fifth supervisors, 2359.

The office of consultant was generally quite irregular in occurrence. However, threshold sizes were established for the first consultant at size 140, a second consultant at size 910, and a third consultant at size 1040. System 3700, which reported forty-six consultants, had over four times as many consultantants as any other system in this study.

Pupil Personnel Services

For the entire sample of forty-one school systems in this study, the following general trend appeared in pupil personnel services. In the smaller school systems the functions of guidance, special education, and pupil personnel services were handled by a single officer. As the school systems increased in size these functions were handled by a number of officers of approximately equal rank. In the largest school systems these three functions were coordinated

in a new department under the direction of a senior administrative officer. This department could probably be best described as the department of pupil personnel services.

Threshold sizes were established for five positions in the department of pupil personnel services at sizes 245, 653, 916, 2041, and 3284 respectively.

Business Offices

After the office of secretary-treasurer, which occurred in all systems, the first additional business position to appear was that of a purchasing agent at threshold size 334. The third business office, which began to occur consistently at size 498, was usually that of the first assistant secretary-treasurer. A fourth office, which began to occur consistently at size 765, was usually that of the first accountant. The fifth business office, which began to occur consistently at size 2041, was usually either an assistant purchasing agent or a second accountant. The sixth business office, which was that of a second assistant secretary-treasurer, began to occur consistently at size 2341.

Building and Maintenance Department

An apparent general trend was that as the size of the school systems increased, the administrative staff of the building and maintenance department increased to the point that nine offices began to occur consistently in the three largest school systems in the sample. The following threshold sizes were established for building and maintenance offices: first office, 113; second office, 515; third

office, 916; fourth office, 1040; fifth office, 1104; sixth office, 2041; and seventh, eighth and ninth offices, 2730.

Personnel Department

No personnel officers were reported by the thirty-five smallest school systems in the sample. However, a separate personnel department began to occur in system 1480 at size 916 with the appointment of a director of personnel. Personnel departments occurred in four of the five largest school systems in the sample with the result that threshold sizes were established for the following positions in this department: first, second and third offices, 916; and fourth and fifth offices, 3284.

Computer Operations

Six of the largest ten school systems in the sample reported a department of computer operations. Threshold sizes were established for three computer operations positions as follows: first office, 1480; and second and third offices, 2359.

Hypothesis Twelve

"Each administrative staff office begins to occur consistently at a specific size of school system."

As threshold sizes were established for fifty-three of the administrative offices in forty-one urban school systems in western Canada, and as the order of appearance of a number of other administrative offices in school systems in the sample were identified, hypothesis twelve was accepted.

Comparison with Gill's (1967) Study

The results of a comparison of the threshold sizes for administrative offices which were established in this study with those which were identified in Gill's (1967) study are summarized below.

First, threshold sizes were established for more offices in this study than was the case in Gill's study. In this study threshold sizes were established for fifty-three offices whereas Gill identified thirty-eight. The difference in the number of threshold sizes established in the two studies may be explained by the fact that this study contained three more school systems than Gill's research, and by the fact that this study contained data for five school years whereas Gill used the data for a single year, 1966-67. As was indicated by the data in Chapter IV of this study, in the years 1967-68 and 1968-69, the school systems in the sample had increased in size and had added administrative offices.

Second, the administrative offices in this study emerged in substantially the same order as did those identified in Gill's research. Where discrepancies existed, they could usually be explained by the fact that some of the offices which Gill reported in his data, had gone out of existence in the 1967-68 or 1968-69 data years of this study.

Third, some of the threshold sizes established in this study were somewhat lower than the threshold sizes for the same offices which were established in Gill's research. The discrepancies here can probably be explained by the fact that this study contained data for

the years 1964-65 and 1965-66. As was indicated by the data in Chapter IV of this study, the school systems in this sample were smaller in size in 1964-65 and 1965-66 than they were in 1966-67, which was the year used in Gill's study. The addition of three school systems to Gill's sample may also have contributed to the lowering of threshold sizes for administrative offices in this study.

As a generalization, the threshold sizes established for administrative offices in this study provided supporting evidence for the threshold sizes for administrative offices which Gill found.

REFERENCES FOR CHAPTER V

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CHAPTER VI

SUMMARY OF THE STUDY AND COMPARISON WITH OTHER RESEARCH

Summary of the Study

In this study an attempt was made to expand Gill's (1967) cross-sectional research on administrative proportion on a longitudinal basis. The purpose of the study was to establish, for the five school years 1964-65 to 1968-69 inclusive, the relationship between the size of school systems and certain characteristics of their administrative staffs. The main problem was divided into a number of sub-problems and twelve hypotheses were formulated and tested.

The sample consisted of forty-one urban school systems in the four western provinces of Canada. The systems in the sample were distributed as follows: eighteen in Alberta, nine in British Columbia, eight in Saskatchewan, and six in Manitoba. Included in the sample were most of the largest school systems in the four western provinces as well as systems with minimal numbers of administrative staff. All systems administered both elementary and secondary education and were urban in character.

The superintendent of each school system in the sample was asked to supply information on (a) the total number of schools, pupils, and teachers in the system for 1964-65 to 1968-69 inclusive, and (b) the numbers and positions of administrative staff in the school system for the years 1964-65 to 1968-69 inclusive. The raw

data received from the superintendents of the forty-one school systems were organized into seventeen variables, administrative staff were identified, and the size of each school system was determined.

Summary of the Results and Comparison with Other Studies

Hypotheses one, two, and three. For certain urban school systems in western Canada, the percentage of staff in administrative positions in a school system was significantly negatively correlated with the total number of pupils in a school system, the total professional and administrative staff in a school system, and the total number of schools in a system. That is, for the school systems in the sample, the administrative ratio in a school system decreased as the size of the school system increased, whether the size of the school system was measured in terms of the total number of pupils in the system, the total number of schools in the system, or the total professional and administrative staff in the system.

One of the above conclusions of this study, that the administrative ratio decreases as the size of the school organization in terms of the total professional and administrative staff increases, provides supportive evidence for similar findings in studies by Anderson and Warkov (1961:26-27), Hawley (1965:253-254), Gill (1967: 103), Tosi and Patt (1967:164-168), and Indik (1964:301-309), and non-supportive evidence for Terrien and Mills' (1955:13) research. As Anderson and Warkov, and Tosi and Patt studied American hospitals, and Hawley studied American institutions of higher education, and Indik studied American package delivery stations, auto sales

dealerships, industrial labour unions, volunteer fire companies, and political organizations, and Gill and the present research studied western Canadian school systems, then the finding that the administrative ratio decreases as organizational size increases, may have general application in a number of business, industrial, and governmental organizations.

The results of the testing of hypothesis two of the present study, which found a significant negative correlation between the administrative ratio and the number of schools in forty-one western Canadian school systems, probably provides supportive evidence for a similar finding by Hawley (1965:253-254), and non-supportive evidence for Anderson and Warkov's (1961:26-27) suggestion.

Hypothesis four. In order to compare the findings of this study with those of Terrien and Mills (1955) and Gill (1967) the school systems in the sample were categorized by size on the basis of the total professional and administrative staff in a school system, into small, medium, and large systems, using the size range 0-249 for small systems, 250-999 for medium systems, and 1,000 and over for large systems. On this basis analysis of variance was applied to the percentage of staff in administrative positions. The Scheffé test showed that there was a significant difference in mean administrative ratio between the groups of small and large systems, which was significant at the 0.011 level. Inspection of the means of the different groups showed that among the school systems used in this study, systems categorized as large had a smaller mean percentage of

staff in administrative positions than systems categorized as medium size, and that the largest percentage of staff in administrative positions was found in the smaller systems. The above results probably provide supportive evidence for Gill's (1967) study and non-supportive evidence for Terrien and Mills' (1955) study.

Hypotheses five to eleven. On the basis of variable four, the total number of professional and administrative staff in a school system, the forty-one school systems in the sample were divided into the following four size categories: group one 56-143, group two 171-400, group three 515-1147, and group four 1387-3700. Analysis of variance was applied to each of the eight variables, from eleven to seventeen inclusive.

Analysis of variance, which was used to test hypotheses five to eleven, yielded the following results. First, smaller school systems had significantly higher mean percentages of staff in total administrative positions, and in central office administrative positions, than did the larger systems. Second, smaller systems had significantly higher mean administrative staff per 1,000 pupils, and significantly higher mean administrative staff per 100 teachers, than did the larger school systems in the sample. Third, there were no significant differences between groups of smaller and larger school systems in the sample in either mean total administrative staff per school, or in mean central office administrative staff per school. Fourth, smaller school systems had significantly lower mean percentages of staff in central office professional positions than did the larger systems.

Fifth, the mean pupil-teacher ratio increased from groups of smaller size school systems to groups of medium size school systems, and then decreased in the group of the largest school systems.

Gittell's longitudinal study (1968:53-55) of the school systems of New York, Chicago, Detroit, St. Louis, Baltimore, and Philadelphia presents results which differ from those of the present study. On the basis of the number of administrators per 1,000 pupils, and on the basis of the number of administrators per 100 teachers, Gittell found that the administrative ratios for New York City doubled between 1955 and 1965, while for most of the other cities in her sample the ratios remained approximately the same. The difference between the results of Gittell's and the present study may be explained by the fact that Gittell had data for a ten-year period, whereas the present study contained information on only five years.

A second possible explanation is that the American school systems in Gittell's research, especially New York City, are much larger than the Canadian school systems in the present study, and the American systems may have begun to be affected by the diseconomies of scale.

A third possiblity is that a five or ten-year longitudinal study only gives part of the total growth curve for school systems. This would suggest that there may be a need for longitudinal case studies of individual school systems for a much longer period than ten years.

Multiple regression analysis was used to examine the relationship between the size of school system in terms of the total

professional and administrative staff and each of the eight variables, from ten to seventeen inclusive.

The relationships between the size of school system and the percentage of staff in total administrative positions, between the size of school system and the percentage of staff in central office administrative positions, between the size of school system and the number of administrators per 1,000 pupils, and, between the size of school system and the number of administrative staff per 100 teachers, were all logarithmic, curvilinear, asymptotic, of the form $x=e^{a-by}$, and negative in slope. The relationships between the size of school system and the number of total administrative staff per school, and, between the size of school system and the number of central office administrative staff per school, did not fit the predicted model, that is, were not of the form $x=e^{a-by}$. The relationship between the size of school system and the percentage of staff in central office professional positions, and, between the size of school system and the pupil-teacher ratio, were curvilinear, asymptotic, logarithmic, of the form $x=e^{a-by}$, and positive in slope.

Graphs were drawn to illustrate the relationship between the percentage of staff in administrative positions and the five-year time period of the study, 1964-65 to 1968-69 inclusive, for each of the forty-one school systems in the sample.

Hypothesis twelve. Threshold sizes were established for fifty-three of the administrative offices in forty-one urban school systems in western Canada during the years 1964-65 to 1968-69 inclusive.

Although threshold sizes could not be established for some of the offices as they appeared too irregularly in the data, the order of appearance of these positions were identified.

Threshold size was defined as the size at which a particular administrative office began to occur consistently. An administrative office was arbitrarily said to occur consistently, if, above a certain size of system it appeared in at least fifty per cent of systems. Consistency of occurrence was determined by an inspection of the data after the school systems were ranked in size from smallest to largest on the basis of the total professional and administrative staff in the system.

Recommendations for Further Study

Longitudinal case studies on several of the largest school systems in western Canada would probably be useful in that this might provide the total growth curve of several school systems from their inception to the present. More complete statements could then be made about the relationship between the size of school systems and the characteristics of their administrative staffs.

It would be in the interests of research to repeat the present study in school systems in Ontario and Quebec, as well as the maritime provinces, to see whether or not the results of this study have any broader application to school systems other than those in western Canada. Since education in Canada is a provincial responsibility, it is possible that some differences in school system administrative staffing among the various eastern provinces may exist.

In the data gathered for this study there were indications that several of the largest school systems in the sample had plans to partially decentralize their administration. In two or three years it would be useful to complete follow-up studies to determine the effects of decentralization on the size and the characteristics of the administrative staffs of school systems.

Non-professional clerical, stores, equipment, maintenance, and transportation section staffs were all omitted from this study. Since their numbers probably bear a relation to the size of a school system, an investigation of this aspect of administration would probably provide information useful to both school boards and educational administrators.

In several years from now, it might be useful to do follow-up studies on the administrative staffs of school systems to determine the impact of new technologies such as those of computers and educational television. This study has shown that the largest school systems in the sample have only recently begun to use electronic data processing. When experience has been gained with such newer technologies it may be possible to administer larger school systems with fewer administrative personnel. Follow-up studies could discover what new trends are emerging in administrative staffing from the use of new technologies.

An aspect of the staffing of school systems which could be investigated is the number and type of professional, non-administrative staff that are added to school systems as they increase in size.

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APPENDIX

FACULTY OF EDUCATION
DEPARTMENT OF EDUCATIONAL ADMINISTRATION

THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA

January 8, 1969

In the 1966-67 school year your system provided data for Norman Gill's cross-sectional research into the way in which administrative and supervisory staffs have developed in school systems. This study was reported in the October, 1968 issue of The Canadian Administrator.

We are attempting to expand Gill's study by using a five year period to determine whether or not a longitudinal analysis confirms Gill's cross-sectional results. Your co-operation is requested to make this possible. This study has the financial support of the Alberta Advisory Committee for Educational Studies.

If enough data can be obtained, the investigation will attempt to establish, for the five school years 1964-65 to 1968-69 inclusive, (1) a relationship between the size of school system and the number and type of administrative personnel employed; (2) the category of size of school system at which it is usual to find specific posts being filled; and (3) a relationship between the size of the administrative component of a school system and the number of schools in the system.

The information sought is (1) data on the size of your school system, and, (2) the number and positions of the administrative staff. On the information sheet please write in the name of the office, and beside it the number of people in this position for each of the five years. This list is meant to include the names of all administrative, supervisory or consultative offices. Thus it would include the following positions:

Superintendents, Assistant Superintendents;

Secretary-treasurers, Assistant Secretary-treasurers, Accountants;

Directors of Branches, Assistant Directors;

Registrars;

Supervisors, Subject Consultants, Advisors;

Special Services Personnel, Psychologists, Guidance, Welfare, and Truant Officers;

Program and Curriculum Assistants, or Officers, or Supervisors;

Research and Development Officers and Assistants;

Library Officers;

Staffing Officers;

Legal Officers, School Architects, and Engineers;

Building and Maintenance Supervisors, Purchasing Agents;

Principals;

Non-teaching Vice-principals, or Assistant Principals (if possible)

The above list is not exhaustive, but it may help to identify those positions required for the study.

Those who are not to be included on the list of administrative staff are teachers, school librarians, school guidance officers, non-professional staff, and all clerical staff.

In the event that amalgamation with another district has occurred in your district during the period under study please proceed as follows. Report the requested data for the main school system up to amalgamation. Ignore the data for the district which has been added to your system up to the time of amalgamation. After amalgamation report the total for the combined districts. For example, assume District A was added to District B in 1967. For the years 1964, 1965, and 1966 report the data for District B and omit data for District A. For the years 1967 and 1968 report the total data for District B and District A. Would you please report data for each year as close to October 31 as practical.

If the school organization in your district will not permit you to supply the information in the format used on the attached data sheets, please feel free to give data in a form convenient to your own system.

Your reply will be held in strict confidence and the report will not identify individuals or school systems. A stamped, addressed envelope is enclosed for purposes of reply.

Thank you for your co-operation,

E.A. Holdaway/per

E.A. Holdaway, Associate Professor,
T.A. Blowers, Research Assistant.

EAH/wr

DATA ON SCHOOL SYSTEM

NAME OF SCHOOL SYSTEM _____

PART I TOTAL NUMBER OF SCHOOLS, PUPILS, AND TEACHERS IN SCHOOL SYSTEM, 1964-65 to 1968-69

Please list the total number of teachers (all grades), the total number of pupils (all grades), and the total number of schools (all schools from primary-elementary to senior high inclusive) for your entire school system, for each year, in the blanks provided. Please indicate the month used for pupil attendance figures _____.

	SCHOOL YEAR				
	1964-65	1965-66	1966-67	1967-68	1968-69
System Total Number of TEACHERS					
System Total Number of PUPILS					
System Total Number of SCHOOLS					

PART II NUMBERS AND POSITIONS OF ADMINISTRATIVE STAFF IN SCHOOL SYSTEM, 1964-65 to 1968-69

INSTRUCTIONS Please list the administrative offices in your school system in the left hand column. Beside each office list the number of people in that position for each year from 1964-65 to 1968-69 inclusive. An example has been given on the first line.

ADMINISTRATIVE OFFICES	SCHOOL YEAR				
	1964-65	1965-66	1966-67	1967-68	1968-69
e.g. Superintendent	1	1	1	1	1

PART II (Cont'd) NUMBERS AND POSITIONS OF ADMINISTRATIVE STAFF IN SCHOOL SYSTEM, 1964-1968

ADMINISTRATIVE OFFICES

	1964-65	1965-66	1966-67	1967-68	1968-69

PART II (cont'd) NUMBERS AND POSITIONS OF ADMINISTRATIVE STAFF IN SCHOOL SYSTEM, 1964-1968

ADMINISTRATIVE OFFICES	1964-65	1965-66	1966-67	1967-68	1968-69

PART III SHORT ANSWER QUESTIONS

1. Did a change of superintendent occur in your school system during the period 1964-1968?

YES ☐ NO ☐

If a change of superintendent occurred, please indicate the date that this took place _____.
Month Year

2. Did your school system amalgamate with another school system during the period 1964-1968?

YES ☐ NO ☐

If an amalgamation occurred, please indicate the year in which this took place and the name of the district (s) amalgamated with yours.

YEAR _____

Name of district (s) _____

3. Please rank the administration of your school system on the following scale. (circle one).

Highly centralized ----------Highly decentralized
1 2 3 4 5

4. Has a change from a centralized to a decentralized administration occurred in your school system between 1964 and 1968?

YES ☐ NO ☐

If you answered yes, please indicate the year in which this took place _____.

FACULTY OF EDUCATION
DEPARTMENT OF EDUCATIONAL
ADMINISTRATION

THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA

January 29, 1969

This is a follow-up to our letter of January 8 in which we requested that you provide data on your school system for our study on the manner in which administrative and supervisory staffs have developed in school systems in western Canada.

In case our original letter and questionnaire went astray in the mail we are enclosing copies of them.

Due to the small number of urban school systems in western Canada, it is essential that we have replies from as many school systems as possible. May we prevail upon you to provide this information for us? A summary of the research will be mailed to those systems that supply data for us.

If our letters have crossed in the mail and you have already responded to our request, may we express our appreciation for your co-operation.

Yours sincerely,

E.A. Holdaway

Dr. E.A. Holdaway, Assoc. Prof.
T.A. Blowers, Research Asst.

EAH/wr

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